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One-stop shops for residential building energy renovation in the EU

*Analysis & policy
recommendations*

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Abstract

This report is the second part of a Europe-wide survey and assessment of one-stop shops (OSS) for energy renovation of buildings. Based on the case studies of 63 OSS in the EU, we find that the approach has a potential to cover 5-6% of the renovation volume of 35 million buildings in 2030 set out by the Renovation Wave Strategy^{1,2} at low social costs, integrating private investments with client-friendly methods. The current level of activity of the European OSS market is estimated to be around 100 000 projects per year.

The OSS can bridge the gap between a fragmented residential building sector, with a large heterogeneous set of households, and the construction supply side. They can help increase the actual renovation rate by supporting potential clients through the various steps of the decision-making process. Their success lies in part with their locally embedded focus, engagement with interested but not yet committed energy users/asset owners and ability to form strong relationships with clients. They can support the renovation journey from start to finish and can facilitate access to financing, occasionally offering better rates. While our analysis identifies several structural, legislative, financial, and information measures with a positive impact on OSS-enabled renovation projects, it is possible to enhance their contribution by reviewing specific policies that support or hinder their success. Although not typical of OSS in general, but with proper incentives, they can improve the average renovation depth in terms of energy performance level by adopting a holistic approach and, at the same time, they can reach out to vulnerable populations, such as tenants of social houses, thus contributing to the alleviation of energy poverty. Finally, OSS can contribute to the enhancement of communities and neighbourhoods. They help current tenants to improve their living conditions and thus stay in the area.

¹ https://ec.europa.eu/energy/sites/ener/files/eu_renovation_wave_strategy.pdf

² Assuming that half of the 35 million buildings are single dwellings and half are condominiums with an average of 20 dwellings.

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³ <http://www.financingbuildingrenovation.eu/>

Executive summary

Energy efficiency is an energy source in its own right, and forms a central part of the European Union's new long-term roadmap, the European Green Deal, among many EU policies. Set to "give more back than it takes away" ([Mwangi 2019](#)), the carbon-neutrality goal of the Green Deal will require a fundamental shift to our everyday practices, supported by innovative policies and new business models.

Policy context

The European Green Deal seeks to lead the deep transformation of the EU in line with the 2030 Agenda on Sustainable Development and the Paris Agreement at regional and national level. It targets eight key areas: increased climate ambition for 2030 and 2050; clean, affordable and secure energy; a clean and circular economy; energy and resource-efficient buildings; sustainable and smart mobility; a fair, healthy and environmentally-friendly "farm to fork" food system; preserving and restoring ecosystems and biodiversity; and zero pollution for a toxic-free environment. A renewed, efficient, environmentally friendly, and user-centred building stock is at the heart of a number of these goals ([European Commission \(EC\) 2019](#)).

In addition, the European Commission has recently launched a new specific strategy to promote renovation of buildings: "A Renovation Wave for Europe – Greening our buildings, creating jobs, improving lives"⁴. As part of the Renovation Wave package, the European Commission has also strengthened its commitment to tackle energy poverty with the "Recommendation on Energy Poverty", which recognises renovation as a key strategy to address energy poverty. This recent initiative builds on other measures focusing on buildings that were agreed under the Clean Energy for all Europeans package, such as the requirement for MSs to publish a long-term building renovation strategy (LTRS), the updated Energy Performance of Buildings Directive (EU) 2018/844, and the Member States' national energy and climate plans (NECP).

Today, buildings account for 40% of Europe's total energy consumption, and more than 75% of the building stock is inefficient in light of current standards. The EU and the Member States have targeted new buildings through various policy instruments from normative through informational and to market-based policies. Building codes and appliance standards – in particular – have had profound market transformational effects across the EU. However, most of the building stock in 2050 will be composed of buildings that already exist today, therefore the improvement of existing buildings has become an urgent pre-requisite for the road to decarbonisation. At the current average ca. 1% annual renovation rate it would take around a century to decarbonize the EU building stock to modern, low-carbon levels.

Therefore, to achieve a number of the Green Deal's objectives simultaneously, including drastic improvements in the overall energy and resource performance of the building stock, more attention and accelerated actions are needed to increase the rate and depth of renovation of existing buildings in all EU Member States

Content

Constructing a new building or renovating an existing one is often an exciting but overwhelmingly challenging journey for homeowners. It requires technical, engineering, administrative and legal knowledge and depends on the smooth collaboration with several specialised service providers, who may be difficult to identify and deal with. Furthermore, there is a high chance of making mistakes.

The opportunity to place a large share of the responsibility in the hands of a single supplier, who could be in charge of the whole project from step 1, may offer an attractive alternative to the traditional way of undertaking this kind of projects. **These suppliers are called "one-stop shops" (OSS)**, and they typically offer "integrated solutions" as a service, assisting with multiple steps of an energy renovation. **An OSS service transforms a cumbersome and complex set of decision-making/actions by non-experts into a single entry, customer-friendly offer.** The OSS concept means moving away from the classic set-up, where asset owners face directly every single entry point of a complex renovation value chain with a number of interlocutors, and where the asset owner – who is a non-expert – has to find the best combination of the parts of a complex solution. Instead, project promoters and householders can benefit from a customer-

⁴<https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52019DC0640&from=EN>

centred service, establishing a bridge between the fragmented supply side and the also fragmented demand side.

In order to narrow the gap in energy saving potentials through renovation projects across Europe, the Clean Energy For All Europeans package in 2016 called for Member States “*to develop dedicated local or regional one-stop shops for project developers, covering the whole customer journey from information, technical assistance, structuring and provision of financial support, to the monitoring of savings.*” In addition, the Renovation Wave Initiative launched in 2020 stated that “*the Commission and the EIB will support setting up standardised one-stop shops that can be deployed quickly at national, regional or local levels for delivering tailored advice and financing solutions designed to accompany homeowners or SMEs throughout the preparation and implementation of their projects*”. Such OSS already operate in some regions of Europe, and around the world.

In order to **assess the viability of OSS** as a successful concept or model in decarbonizing the European building stock, this report provides:

- An overview of the concept of OSS (general description and typing of the existing or planned concepts and business models);
- An outline of associated benefits and challenges;
- A critical review of the current state of the OSS market by case study examples from different market segments (European, national, regional and local);
- An identification of key features for successful OSS;
- The role of OSS in deep decarbonisation and social goals.

The report offers an in-depth assessment of the current market status of home renovations supported by integrated services (OSS) through the analysis of working case studies of one-stop shops across Europe. These case studies are reviewed systematically in the report. Examples are not restricted to best practices; businesses that had to be ended are also presented. This allows for a deeper understanding of what a “one-stop shop” should ideally represent.

Main findings

We identified **63 OSS in 22 EU Member States, 57 of which were found to be operational in 2020**. Around 2/3 of the EU Member States have at least 1 OSS in their renovation markets, with current levels of EU-wide activity estimated to be around 100.000 projects per year. This represents about 4-5% of the renovation projects already⁵. The identified conditions, namely favourable policy environment, availability of financing, experience sharing, transfer of models within countries and across countries, implies that the OSS market is on the rise. Our findings show that **OSS have increased in numbers and activity in the last 5-10 years**: 70% of the OSS were launched after 2012, and only about 10% of the identified OSS have ceased operations. **If the OSS renovation volume was to increase by 10% per year in the next 10 years, then OSS could cover about 5-6% of the renovation volume of 35 million buildings in 2030 desired by the Renovation Wave Strategy**^{6,7} at low social costs, integrating private investments with client-friendly methods.

The European building market is typically top-down and supply driven, with a discrepancy among the offered products and the end-users needs and affordability. The OSS are in a position that they can bridge this gap between the users and the construction supply side, and therefore increase the actual renovation rate by moving potential clients through the last steps of decision. The OSS services are effective because:

⁵ A reliable calculation is difficult to make, because there is no data on the floorspace covered in OSS projects yet. While, there is no reliable statistics available on the number of renovation projects in the residential sector. We assumed an average of 1,2% renovation rate of the almost 200 million dwellings across Europe. Given that OSS work mostly with single family houses, the average number of dwellings in a project is two, in addition to considering that some projects reported here tackle non-residential buildings.

⁶ https://ec.europa.eu/energy/sites/ener/files/eu_renovation_wave_strategy.pdf

⁷ Assuming that half of the 35 million buildings are single dwellings and half are condominiums with an average of 20 dwellings.

- ✓ They are locally embedded, know the local market, the local clients and the local conditions;
- ✓ They have an interactive relationship with the clients;
- ✓ They can follow-up even on finished projects;
- ✓ They can accelerate building refurbishments by informing, motivating, as well as by assisting building owners to follow through energy efficiency investments, by providing support from the start to the end;
- ✓ They can facilitate interested, but not yet committed energy users/asset owners to actually implement an energy saving measures or other sustainable projects;
- ✓ They can facilitate access to financing and occasionally offer better rates;
- ✓ They can even potentially improve the average renovation depth in terms of energy performance through the holistic approach;
- ✓ Sometimes they can reach out to vulnerable populations, such as tenants of social houses, and contribute to tackle energy poverty.

OSS do not only renovate a home, but also contribute to the enhancement of communities and neighbourhoods. They help current tenants to improve their living conditions and thus stay in the area.

OSS belong to 6 main categories in terms of organisational structure and operational details.

- Government-driven (national/regional or local) OSS: Their programmes are mostly driven by climate and/or energy considerations, sometimes by social targets.
- Industry driven OSS: Manufacturers or installers that aim to extend their businesses or improve customer care.
- ESCO based OSS: Building on their complex offerings, they extend and reclassify their value-added solution-parts.
- Facilitator OSS: Consultants that develop their original customer-related businesses, e.g. by extending the types of services, in order to reach more customers
- Cooperative type OSS: Aims mostly at the societal benefits, not necessarily focused only at energy savings/cost savings
- Store OSS: A large store or a warehouse, where the shoppers can get acquainted with the technologies and products, and have a personal contact option to ask for tailored advice and further assistance at the spot.

The key benefit of OSS in Europe is their ability to enhance building renovation in the residential sector and offer holistic solutions. Building renovation is a complex and time-consuming investment with significant budget requirements that homeowners need to carefully consider. While OSS can help reduce the hurdle, the risk, and the time needed to invest in the project, further actions are needed to simplify renovation processes. These include:

- ✓ Combination of energy with other renovation types: Partnership with transaction companies at the right timing;
- ✓ Reduction of costs and time via standardization of techniques (e.g. using pre-fabricated technical elements) or processes;
- ✓ Promotion of one-off, large and holistic interventions whenever possible without excluding the step-by-step approach; the latter would be more appropriate for homeowners who set aside budget over time rather than all at once;
- ✓ Packaged interventions for quick screening and first contact with the clients;
- ✓ Bespoke services to meet specific needs;
- ✓ Support of financial instruments, such as grants, tax relief, bank loans and establishment of innovative financing mechanisms (EPC, PACE, etc.) that may involve other security and contractual elements.

OSS interact with policies at EU, national, regional and local levels, and it is possible to enhance the impact of OSS on energy renovation rate and depth by reviewing the policies that support or hinder their successes. In particular, the policy instruments and factors that can contribute to make OSS effective at promoting energy renovations are:

- ✓ Climate and energy targets (EU, national and city levels);
- ✓ Renovation pledges;
- ✓ Administration and public sector taking the lead at renovating their buildings;
- ✓ Energy efficiency policy framework (EU, national, regional and local levels);
- ✓ Energy regulation for individual houses;
- ✓ National subsidies, tax reliefs;
- ✓ EEOs;
- ✓ Local grants or tax reliefs;
- ✓ Loans linked to the buildings, e.g. collected with utilities;
- ✓ Favourable regulatory framework for the diffusion of ESCO/EPC;
- ✓ Horizon Europe projects promoting building renovation, especially deep renovation and information dissemination about business models;
- ✓ Information campaigns and promotion at the national or local levels.

Related and future JRC work

The JRC has been involved in the technical and scientific support of EU energy efficiency policies and in particular policies related to financing energy efficiency investments and creating a market for energy efficiency. Several reports have been published on the topic by the JRC and are available on the E3P Platform. The JRC, inter-alia, investigates the One-stop Shop concept, the value of non-energy benefits in appraising energy efficiency projects and the latest development in the energy services markets. The 2018 JRC report on the OSS status provides the foundation of the current study: Boza-Kiss, B. and Bertoldi, P. 2018. One-stop Shops for energy renovations of buildings: case studies. European Commission, Joint research Center: Ispra, Italy ([Boza-Kiss and Bertoldi 2018](#)).

1 Introduction

The year **2020 was a critical checkpoint** in terms of global and European efforts for a comprehensive energy transition and climate change mitigation. Whilst energy statistics are not yet available for 2020, the latest 2019 data show that final energy consumption in the EU-27 stabilised in 2019, but only nine Member States (Finland, Greece, Italy, Latvia, the Netherlands, Portugal, Romania, Slovenia and Spain) were on track toward their respective 2020 final energy efficiency targets (EEA, 2020). The European Union (EU) has been increasing commitment and achievements over the years, while leading by example on the global stage. The **pivotal 2020 targets⁸** (EC ([2015](#))) were followed by **2030 pledges^{9,10}** (to be revisited in 2023), and have been recapped with the recent **European Green Deal** (EC ([2019](#))). The Deal includes a '**renovation wave' initiative** in the buildings sector, which has been launched October 2020 (EC ([2020](#))).

Energy efficiency – “an energy source in its own right” – is a pillar of achieving the energy, the climate, as well as the economic goals ([Saheb and Ossenbrink 2015](#)). The **energy efficiency first principle¹¹**, shall underline future European strategies and policies. It means to “*consider, before taking energy planning, policy and investment decisions, whether cost-efficient, technically, economically and environmentally sound alternative energy efficiency measures could replace in whole or in part the envisaged planning, policy and investment measures, whilst still achieving the objectives of the respective decisions. This includes, in particular, the treatment of energy efficiency as a crucial element and a key consideration in future investment decisions on energy infrastructure in the Union.*”¹².

In order to drastically and rapidly reduce overall energy consumption, **decarbonizing the European building stock will be one of the cardinal tasks**. A carbon neutral or even carbon positive building sector is **not only a challenge, but also a unique opportunity** to reap the multiple dividend offered by deep structural transformation.

1.1 The European building sector

The building sector is the **single largest greenhouse gas (GHG) emitter** in the European Union, being responsible for around 40% of the EU's total final energy consumption, 60% of the electricity demand, and 36% of all CO₂ emissions in 2015 (EC ([2019](#))). On average, European residential buildings consumed little over 200 kWh annual final energy per m² in 2014, but disparities are large across Member States, ranging from ca. 95 kWh/m² in Portugal and Cyprus to over 300 kWh/m²/year in Romania and Estonia (EC ([n.d.](#))).

While overall efficiency improvement of the whole economy are estimated to have been 18.6% between 2000 and 2016 for the whole EU, that of the building sector is calculated as 27.8% ([Enerdata 2019](#)). Without energy efficiency improvement, both energy consumption of the building sector would have increased by 90 Mtoe more between 2000 and 2015 (see Figure 1). The **drivers of energy consumption growth in the residential building sector were included the increase in the number of dwellings**, the growth of appliance density and the size of the living space in order of importance. These were fully compensated by energy efficiency improvements.

⁸ The 2020 climate and energy package was agreed in 2007 and enacted in 2009, to adopt the triple-targets of (1) 20% cut in greenhouse gas emissions (GHG) from 1990 levels, (2) 20% of EU energy to be produced from renewables, and (3) 20% improvement in energy efficiency in 2020. The pledges became headline targets of the Europe 2020 strategy for smart, sustainable and inclusive growth. URL: https://ec.europa.eu/clima/policies/strategies/2020_en.

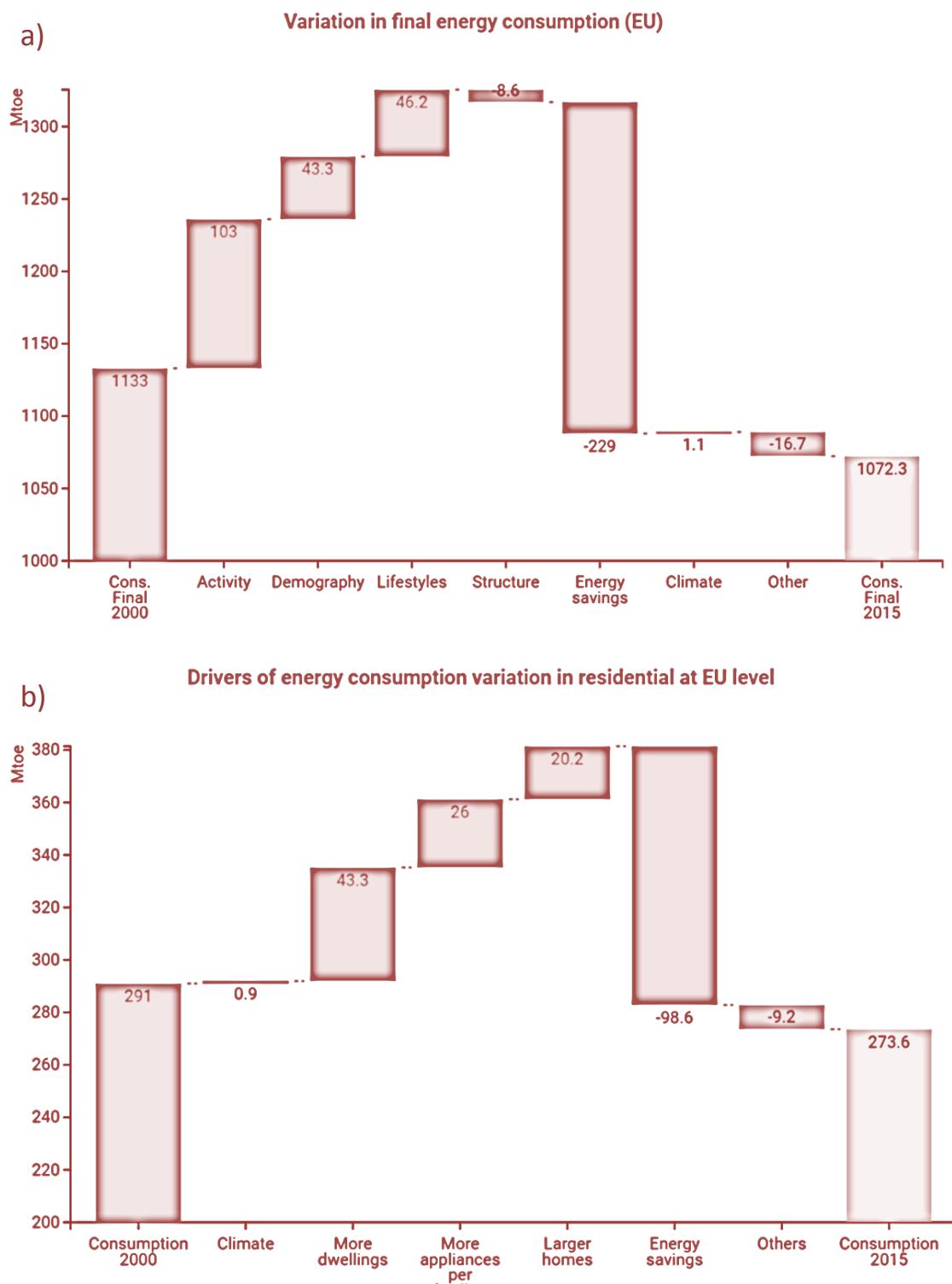
⁹ Within the Energy and Climate Policy Framework for 2030, the EU pledged (1) to reduce greenhouse gas (GHG) emissions by at least 40% by 2030 compared to 1990 levels, (2) to increase the share of renewable energy consumed to at least 32%, and (3) to save at least 32.5% energy compared with the business-as-usual scenario to increase Europe's energy security, competitiveness and sustainability.

¹⁰ Part of the so-called Juncker Commission priorities.

¹¹ European Commission Communication of the Clean Energy for All Europeans policy package ([COM\(2016\) 860_final](#)) and the Governance Regulation ([EU\(2018\)1999](#)) as described in Pato et al. (2020).

¹² Recital 64 of the Governance Regulation ([EU\(2018\)1999](#)).

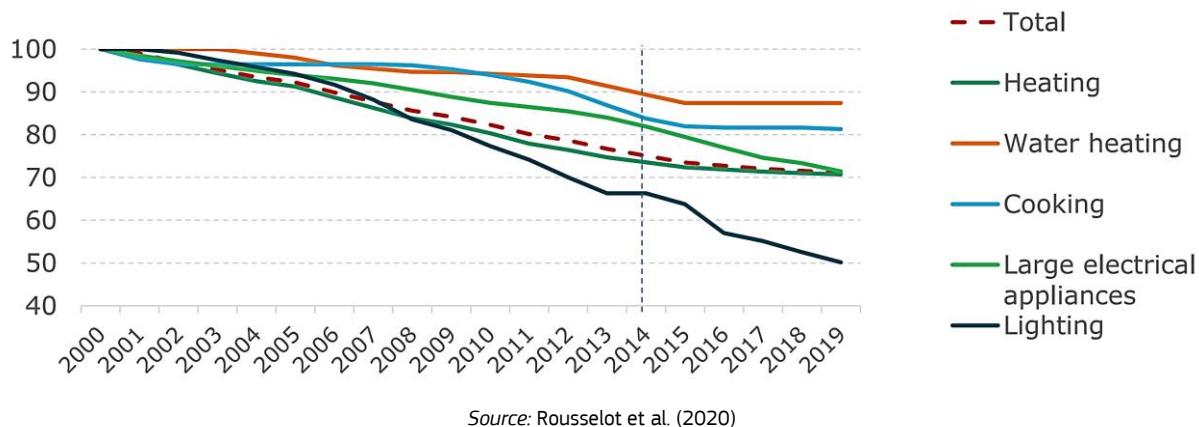
Figure 1. Decomposition analysis of final energy consumption in the EU. a) whole economy, b) residential buildings sector.



Source: Enerdata (2019)

Energy efficiency in households has improved by around 30% between 2000 and 2016, largely due to **more efficient heating systems and more stringent building codes**. The largest rate of improvement is registered for space heating (-2.3%/year), which is the most important end-use in the residential building sector (66% of total household consumption) ([Rousselot 2018](#)) (See Figure 2).

Figure 2. Energy efficiency trends for key household end-use categories at EU level based on ODEX¹³.



Similar trends are seen in the tertiary buildings sector, although its overall energy consumption increased steadily by 2.7% per year between 2000 and 2008 and remained almost stable between 2008 and 2016 ([Rousselot 2018](#)). **The growth in activity** (i.e. floorspace) **outweighed the compensational effect of energy efficiency improvement**.

While the theoretical consumption of a new buildings in 2018 today were about 40% less than for dwellings built before 1990 ([Rousselot 2018](#)), average buildings still use energy very inefficiently, and the overall, sector level energy saving gap has been so far only superficially tapped. Though the legal and regulatory framework has strengthened continuously, and the Buildings Directive (EPBD) and the Energy Efficiency Directive (EED) provisions have had some transformational impact on the building sector, **decarbonisation is still far away**.

1.2 Problem statement: aim of the report

Rapid transition towards a nearly-zero (nZEB) or low energy building stock could be a game-changer both at the macro and at the micro level. Such a transition would not only contribute around 80-95% of the overall GHG emission reduction targets in 2050, but would have significant impact on the economic activity of a number of other sectors. This translates to a reduction of the GHG emissions of the building sector by 88 to 91% (compared to 1990 levels) (EC ([2016](#))). At the individual or household level, benefits are manifold, including better comfort, improved health, higher property value, etc. (more details in chapter **Error! Reference source not found.**).

The following four components define an increase in energy savings from the residential building stock:

1. Low energy performance new buildings: Minimizing floorspace growth, increasing performance requirements for new buildings while ensuring compliance. Significant development has been achieved in this area via the revision of e.g. the EPBD (see more in chapter 2.5). From 2020, Member States must ensure that buildings comply with at least the nearly-zero energy standards (nZEB).
2. Renovation rate: The current annual renovation rate of the building stock is around 1% in the European Union. When levelling the different levels of renovations to a theoretical “major renovation equivalent value” developed by the ZEBRA project, the renovation rate spreads from 0.08% of total residential floorspace in Spain to 2.01% in France in 2014 ([ZEBRA2020 project 2016](#), [Grasset and Scoditti 2019](#)). These rates should at least double or triple in average to reach around 3-4% major renovation per year from 2020.
3. Depth of renovation: The definition of energy efficient renovation varies across Member States and also within EU legislation. In practice, very deep renovation (around 80-90% energy savings) is rare

¹³ An index to measure the energy efficiency improvement, developed by the Odyssee-MURE project. The documentation is found at <http://www.odyssee-mure.eu/publications/other/odex-indicators-database-definition.pdf>. The ODEX takes the specific energy efficiency improvement of a selection of end-uses and large appliances, and calculates the weighted average for the sector.

in the EU, i.e. less than 5% of all renovation (BPIE ([2017](#))). While stepwise renovation contributes to the overall savings, reaching wide-scale deep renovation would increase benefits at multiple levels.

4. User decisions and behaviour: Besides technical measures, the decisions and behaviour of users and owners of buildings can affect the energy consumption to up to 50% difference. Increasing general awareness and specific knowledge of home decision-makers about their own consumption, improving motivation and ability to use energy efficiently are critical measures.
5. However, the building sector has a very low inertia. Considering four key stakeholder groups in the construction and renovation markets (demand-side players – that is home owners and users, supply-side – that is contractors, policy-makers and financiers), all of them have strong roles in hindering a systemic building sector transformation. On the demand side, building owners and users find renovation to be cumbersome and financially demanding, thus postpone major works. On the supply side the value chain is complex and interdependent. The building process is typically a multi-level collaborative network, with many labour actions on the buildings site, with many sub disciplines involved, leading to extra costs and failure risks. Furthermore, a roll-out of home renovation would depend very much on policies and policy-makers, which are not yet well versed in this area. While European Member States have in place a plethora of policies and measures to address the energy performance improvement of the building sector, attention has been largely given to new buildings and to non-residential buildings. Equally, financiers have largely stayed away from the home renovation market because of the technical and investor risk, even though mechanisms are emerging to compensate for these ([Brown, Sorrell et al. 2019](#)).
6. The social and environmental urgency of large-scale integrated retrofitting of the European building stock is widely acknowledged and supported by Member states. However, the building industry and building services currently are not able to offer integrated solutions for large-scale, deep renovation of residential buildings on a systematic level ([MORE-CONNECT project 2019](#)). Public policies have so far been too focused on subsidies and other financial mechanisms. Therefore, a variety of new measures and incentives should be designed and tested.
7. One such candidate for providing holistic, integral solutions for residential building renovation, even towards nZEB for reasonable costs and good quality are the so-called one-stop shops (OSS).

One-stop shops are transparent and easily accessible facilitation tools from the clients' perspective; and innovative business models from the suppliers' perspective. An OSS overcomes the market fragmentation on both the demand side and the supply side by offering holistic, whole-value-chain renovation solutions.

The current report is the **second part of the earlier JRC report on one-stop shop case studies** ([Boza-Kiss and Bertoldi 2018](#)). It aims to provide an overview of the one-stop shop concept (or understood as a business model) in the European context based on past and current case studies.

1.3 Structure of the report

In chapter 2 the state-of-the-art of home renovation in the EU is presented as a background analysis of the market that OSS work in. It also gives an overview of the relevant policies and frameworks. Chapter 3 describes the OSS concept in theoretical terms exemplifying key features with real cases. It also assesses the practical features and the on-the-ground offer of OSS. Chapter 4 maps the OSS around the EU identified in the scope of this study, and chapter 5 gives an assessment of public policies at EU and national levels that have and can support or impede the OSS markets. Finally chapter 6 offers policy relevant recommendations, detours to socially critical topics (such as energy poverty and social housing). At the end, conclusions from the analysis are put forward.

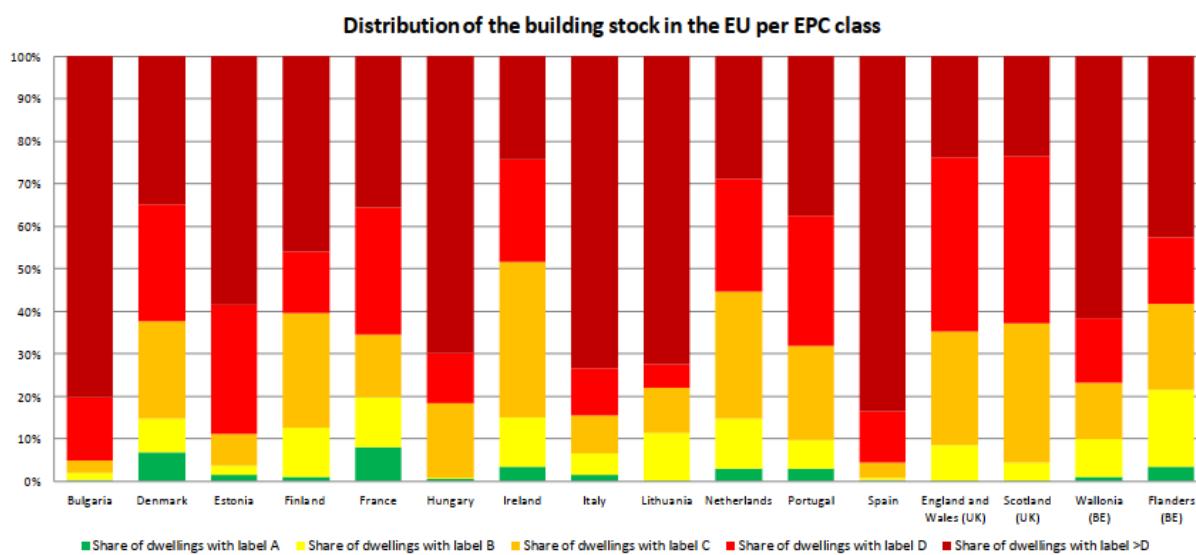
While this report mentions OSS in several sub-sectors, single houses, apartment buildings, public buildings, appliances, etc., but focuses on the OSS operating in the residential building sector.

2 State-of-the art in home renovation

Standards for new buildings and specific end-uses have improved significantly during the last 20-30 years. As a result the **theoretical consumption of a new building today is about 40% less than for dwellings built before 1990**. Yet the **overall stock of existing buildings remains very inefficient** and progress of improvement is slow due to a number of reasons.

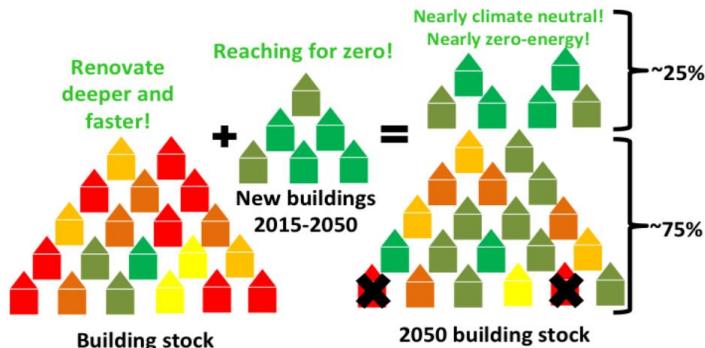
- The large majority of the building stock is inefficient (Figure 3). Large majority of the building stock was built before thermal requirements and energy related building codes. The generally accepted rate of inefficient buildings is 75% (e.g. in the EPBD Impact Assessment (EC (2016)), while a study by BPIE showed that only 3% of all the buildings qualify for “A” labelled Energy Performance Certificates (EPC), thus around 97% of the building stock needs energy renovation (BPIE (2017)).
- The share of new dwellings is around 0.68% per year (Fabbri 2018). Assuming the same construction rate, a maximum of 25% of the building stock will be new in 2050. If compliance is maximal, these buildings will be built as nearly-zero energy buildings. But still, 75% of the buildings in 2050 are already built today with the current average rate of energy performance (Figure 4).
- At the current (less than) 1% average annual renovation rate it would take around a century to decarbonise the EU building stock. In the UK, it was estimated that one building would need to be retrofitted every minute for 40 years at an estimated cost of £85 billion to achieve the long-term carbon emission targets of 80% GHG emissions reduction by 2050 relative to 1990 (Dixon and Eames 2013). To this end, the UK has established legally binding, 5-year carbon budgets (Brown 2018).
- Only 12% of all residential building renovations can be considered as “deep renovation” (Fabbri 2018).

Figure 3. Distribution of dwellings along the EPC categories. Data from the EU Building Stock Observatory, national databases and reports by the Concerted Action EPBD. The sample covers half of EU Member States.



Source: BPIE (2017)

Figure 4. Building stock composition forecast in 2050.



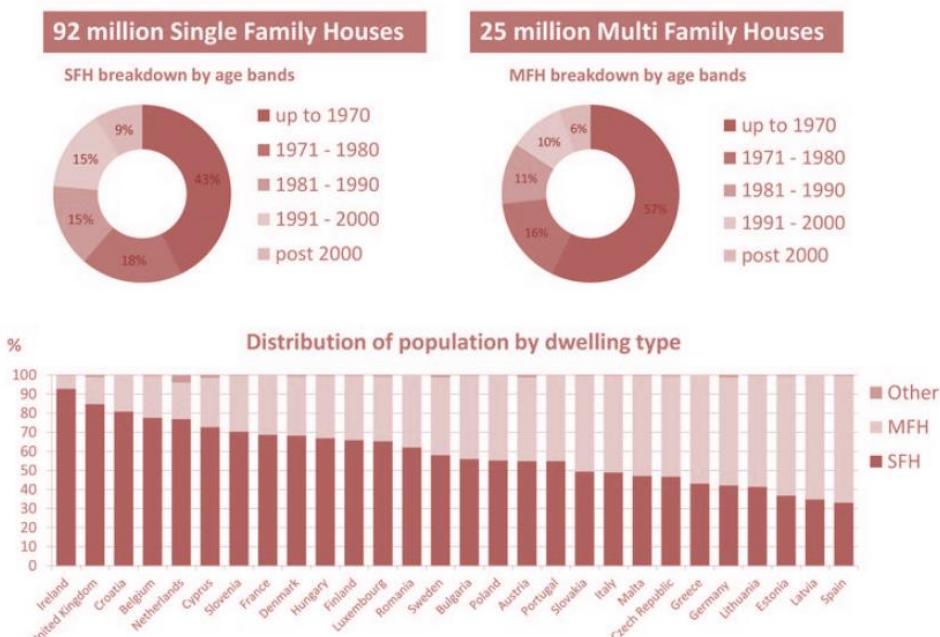
Source: De Groot (2015)

In summary, the **energy performance of the EU building stock is dominated by the existing buildings and shallow renovations**, which has important **implications for the 2030 and 2050 building stock**. **Focus on existing buildings must grow, and 90% of the building stock should be renovated deeply or demolished by 2030, in order to achieve a climate-neutral building stock**. This means a rate of 3-4% of the buildings should be (deep) renovated per year.

2.1 The renovation market value

The residential building stock represents around ¾ of the total building stock in the European Union¹⁴. The size of the residential building stock is large: over 120 million residential buildings exist in the EU (Figure 5), consisting of three fourths of single buildings and one fourth of multifamily buildings.

Figure 5. The size of the residential building sector in the EU. Note: SFH = single family houses, MFH = Multifamily buildings.

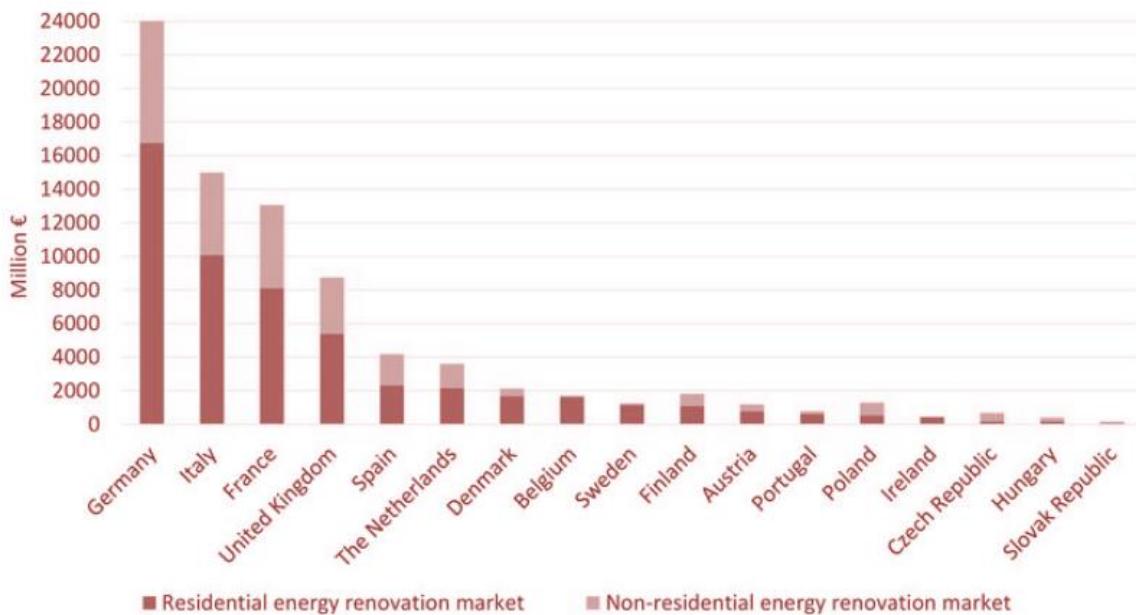


Source: Fabbri (2018)

¹⁴ According to the Odyssee-Mure database, residential buildings in the EU27 occupied around 16 918 Mm² of floor area while services 5 762 Mm² in 2018. In terms of number of buildings, non-residential stock accounts for around 46.3 million buildings in 2017 (EU Building Stock Observatory).

Estimates about the **full renovation market size of the EU revolve around 100 billion EUR per year¹⁵ (2016)**, concentrated in Germany, Italy, France, and the UK, and huge disparities across Member States (see Figure 6). The **residential sector represented 65% of this potential** and 45% belonged to the tertiary building sector.

Figure 6. Estimated value of the renovation market in selected Member States.



Source: Saheb (2016) in Fabbri (2018).

The renovation market **employed 882,900 jobs in 2015** ([Saheb 2016](#)). The share of the renovation works has overtaken the share of new buildings related works, with a tipping point in 2009 during the financial and construction sector crisis.

There are many, though often isolated, good examples of home renovation projects (see for example the collections on Build up¹⁶, on the Renovation hub¹⁷, etc.). Some of these are bottom-up or industry driven, while some of them have been promoted by certain local, national and EU level policies (see more in chapter 2.5) However, the **wider uptake of large-scale and deep renovation is vital for approaching the target of climate neutral and even climate adapted building stock**. The energy renovation market has a long tradition, but according to Smil (2016) unfolding the energy transition takes time, and while there are wishful hopes (e.g. ([Sovacool 2016](#))), it is likely that a transition in a few years or decades is not realistic. Having said that, there are certain **leaps that can contribute to shortening the diffusion period**, for example the industrialization by EnergieSprong (([Transition Zero 2018](#)), see later in chapter 3.4.4).

Saheb (2016) compared 2030 projections of the renovation market value using two models, with scenarios depending on the stringency of the 2030 energy saving target. In the scenario of an implemented 30% EU-level savings target, which is closest to what was agreed in 2018, the EU building renovation market is forecast to be worth 112-113 billion EUR in 2030 (see Table 1). This is a minor increase from current the value. On the other hand, a more stringent target could lead to an increase of renovation value of 10-30% (Table 1).

¹⁵ 109 million EUR in 2015

¹⁶ Build up. 2017. EU support for (deep) energy renovation of buildings. URL: <https://www.buildup.eu/en/news/overview-eu-support-deep-energy-renovation-buildings-0>

¹⁷ Stunning project. 2019. Case studies. URL : <https://renovation-hub.eu/>

Table 1. Projections of the renovation market value in 2030, based on 2015 status by two models, GEM-E3¹⁸ and E3ME¹⁹.
EE27 = 27% energy saving target, EE30 = 30% energy saving target, EE40 = 40% energy saving target

Billion €	EE27	EE30	EE40
GEM-E3	109	112	122
E3ME	110	113	149

Source: GEM-E3 and E3ME.

According to the Buildings Performance Institute Europe (BPIE n.d.), **deep renovation of buildings in the EU could cut 36% of their energy consumption by 2030**, while reducing EU energy import dependency, creating growth, innovation and employment, reducing fuel poverty and resulting in more comfortable and healthier buildings.

Public policies are able to move the market beyond the regular market forces, and thus are required to ensure a higher rate and a more comprehensive renovation strategy across all Member States.

2.2 The benefits of home renovation

Building renovation holds **numerous benefits in addition to direct energy savings**. The summary below gives a snapshot of the multi-facetted benefits relevant for different stakeholder groups. (The collection reflects the benefits of home renovations, but many of the benefits occur for any kind of building.)

Table 2. Micro-level benefits occur at the building level: Benefits for tenants/users

Benefits for tenants/users	
Energy cost savings	Operating cost savings, which can reach up to 80-95% reduction, and even become positive in case of energy plus building
Improved comfort	Well insulated homes feature a more balanced room temperature profile, less need for heating and cooling (thus less dry air and potential germs), a lack of heat bridges, reduced draught
Better health conditions	Better indoor air quality and reduced draughts ensure a better indoor environment. Properly insulated buildings are also free from mould.
Improved quality of life	By getting informed during an energy refurbishment and consequently from bills and EPCs, people often change their lifestyle and may achieve an additional 1-5% saving (Allcott and Rogers 2014)

Source: based on various sources

¹⁸ GEM-E3 is a multi-regional, multi-sectoral applied general equilibrium model to understand the interactions between the economy, the energy system and the environment. It is developed by the National Technical University of Athens and collaborators.

¹⁹ E3ME is a global, macro-econometric model that depicts the economic, social and environmental challenges via an integrated treatment of economies, energy systems, emissions and materials demand. The E3ME model has a detailed sectoral disaggregation and uses annual timesteps until 2050. It is developed by Cambridge Econometrics. More information: <https://www.e3me.com/what/e3me/>

Table 3. Micro-level benefits occur at the building level: Benefits for building owners

Benefits for building owners	
Improved energy performance	Adding to a comparative advantage on the market, renovated homes are sold and rented out quicker and for higher price (Zancanella, Bertoldi et al. 2018)
Increased value of the building	Property value increases by 2-10% (dependent on the location, other building characteristics) (Zancanella, Bertoldi et al. 2018)
Incentivizing general remodelling	Energy renovation is often carried out in combination with other refurbishment work (combining them either way), further adding to the overall value of the building
Reduced maintenance and repair costs	Automation, modern equipment, state-of-the-art solutions can reduce the need and cost for maintenance and repair (even if not a clear-cut rule, e.g. in case of higher connectivity, additional technology, etc.) (Cluett and Amann 2015)

Source: based on various sources

Table 4. Macro-level benefits occur at the societal level: social benefits

Social benefits	
Reduction of energy poverty	Around 34 million households in the European Union struggle to keep their homes adequately warm ²⁰ .
Overall poverty alleviation and equalizing effect	Energy renovation offers savings on disposable income, which is more important for less affluent households who spend large portion of their income on heating and utility costs
Employment	Energy renovation supports employment, with a ratio of about 19 jobs/€ million (Aitola, Rademaekers et al. 2016). The renovation market employed 882,900 jobs in 2015 (Saheb 2016)
Well-maintained neighbourhood, city character	Though not without counterexamples, but home owners that care for their own properties and buildings, usually thrive for a quality local environment, and thus often improve either the local community conditions and/or join for community-owned solution for e.g. heat production.
Aesthetics value	Energy renovation is often combined with other types of refurbishments, and especially with improved aesthetics (as exemplified in Sweden by (Bravo, Pardalis et al. 2019))

Source: based on various sources

²⁰ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32020H1563>

Table 5. Macro-level benefits occur at the societal level: benefits for the global and local environment

Benefits for the global and local environment	
GHG savings	A roll-out of deep energy renovation would lead to a significant reduction of carbon footprint (estimated in 2014 at 90% by 2050 compared to 1990 in the EU) (Artola, Rademaekers et al. 2016)
Reduced material demand	When renovation prevails, waste and input material demand are reduced
Improved air quality	Reduced primary energy and resource demand has a direct impact on reducing air pollution,
Avoiding lock-in	Deep renovations avoid solutions being fixed for long periods – until the next renovation can take place.

Source: based on various sources

Table 6. Macro-level benefits occur at the societal level: economic benefits

Economic benefits	
Energy demand savings	Savings on the systems costs (e.g. capacity extensions), increasing security of supply (IEA (2019))
GDP and public budget	Investments in EE generate between €1 to €4 for each € invested
Construction sector stabilization	Renovation activity has a construction stabilizer impact (more balanced rate of contracts and more jobs) (Saheb 2016)
Competition and innovation	Renovation works are in the hands of local workers, local companies, therefore they empower the local industry and local craftsman. As a consequence of learning, there is also a local impact on innovation capacities.

Source: based on various sources

Overall, renovating private homes has a benefit-cost ratio of ca. 4:1 ([Rosenow, Platt et al. 2014](#)), reflecting reductions in healthcare expenditure, elimination of energy subsidy pay-outs, job creation and greater economic empowerment of citizens who are lifted out of energy poverty.

As it is shown in chapter 3.3, several of these benefits are particularly valid in case of one-stop shops or community based integrated solutions.

2.3 Barriers to energy efficient home renovation

The renovation sector is characterized by conservatism (see above the claims of ([Smil 2016](#))), as well as ridden with a risk of losing momentum (due to lock-in). The renovation process consists of a complex series of contractual relationships, where asymmetric information, availability of financing or knowledge about financial solutions hinder or postpone personal decisions. In a multi-apartment house furthermore, a lack of common goals, the co-existence of various life stages contribute to split incentives.

While the barriers to building renovation uptake are diverse, a number of authors pointed out that focusing on each of them separately could be a mistake (e.g. ([Wilson, Crane et al. 2014](#)), and instead they should be seen as part of the decision process by owners and tenants.

Table 7 gives an overview of key barriers specific in the residential renovation sector, as well as the approach identified that could help alleviate the given barrier. The different barriers have varying impact on households that are in different phases of life: young people looking for temporary accommodation, young families looking for more long-term solutions, elderly and couples or singles whose children recently moved out.

Table 7. Barriers explaining the energy efficiency gap in the residential renovation market.

Barrier	Barrier description	Relevance to young singles/ couples	Relevance to families	Relevance to elderly	Policy option to overcome barrier
- ECONOMIC					
Upfront costs	• High investment costs • Delayed benefits	Usually small or no equity	Many other costs, but more future-oriented	Short-term planning	Grants, ESCO, preferential loans, information provision making salient future benefits
Need for loan	• Creditability questions with financiers • Loan aversion	Low creditability	Aversion to loans	Low creditability Aversion to loans	Guarantee provision, information/awareness raising, on-bill loans, preferential loans
Split incentives	• Landlords might underinvest under the fear of not being able to recoup costs of investments in the rent	Typical tenants	Country-specific	Country-specific	Regulation, obligation of seller/landlord, renovation mandates, mediation
- INFORMATION					
Information asymmetries/ contractor risk	• Unknown quality of work • Lack of trust • Low contractor credibility	Knowledge gap, difficulty of selecting good contractors	Knowledge gap, difficulty of selecting good contractors	Knowledge gap, difficulty of selecting good contractors	Quality assurance, trusted brands, accreditation schemes
Outcome uncertainty	• Unknown co-benefits (i.e. comfort, health)	Usually renting, no own home	Owned homes, big potential	Small homes, limited potential	Risk transfer (ESCOs), guarantees, advisory services, information and awareness raising
Incorrect beliefs	• Incorrect beliefs over future benefits of energy renovation • Misperception of energy use	Lack of knowledge	Lack of knowledge	Lack of knowledge	Energy audits, information and awareness raising, advisers, home energy certification
- DECISION MAKING					
Limited attention	• Imperfect information-processing capacities (people base their choices on elements that capture more attention)	Usually renting, no homeownership	Focus on comfort and practicality	Focus on comfort and health	Alignment with other renovation opportunities, energy audits, education, advisers, information provision making salient relevant attributes
Social invisibility	• Weak social signalling/comparison	Other frequent practices among peers	Lack of examples	Low value given to EE renovation	Community-based promotion programme, dissemination of success stories, norm-based interventions
Cognitive burden	• High costs for information search	Difficulty in contracting the right contractors	Difficulty in contracting the right contractors	Lack of experience, difficult to select good contractors	Advisory services, information, trusted sources, accreditation schemes, contractor lists, simplified renovation solutions (industrialized packages)
Loss aversion	• Anticipated disturbance, stress, inconvenience, • Anticipated loss of options with irreversible investments	Usually rented and short-term housing, so benefits from renovation are perceived as too uncertain	Fear of need for further change (due to family structure change), leading to perception of uncertain renovation benefits	Fear of home-of-life loss	Advisory services, single contractor, public service help, renovation solutions presented as a way to avoid losses
Status quo bias/sunk cost fallacy	• Psychological commitment to status quo and costly investments made in the past	Short-term stays induce preference for status quo	Commitment to previous investments	Commitment to previous investments, fear of change	Good examples, success stories, peer exchange, pooled renovations, step-by-step renovation, packages leveraging default options

Source: Based on ([Wilson, Crane et al. 2014](#), [Wilson, Crane et al. 2015](#))

Barriers do not only associate with the demand side of energy efficiency building renovation. The **supply side** (installers, engineers, planners, producers, etc.) can be described with the following barriers ([Cirman, Mandic et al. 2011](#), [Palm and Reindl 2018](#)):

- **Collaboration gap:** the players at different points of the value chain do not properly collaborate, they rather compete.
- **Arrangement gap:** the suppliers depend on each other, and have to join the renovation project at a specific point, which is dependent on the work and timing of the previous steps. If a previous player is late or his/her work quality is not appropriate, the following players are affected.
- **Trust gap:** renovation occurs only one or few times in the life of a customer, and one cannot develop traditions and cannot build on previous experience, therefore trust has a very high importance on both the side of the customer and on the contractor. Contractors can have hard time recovering their invested time, expertise and technology in case a customer fails to pay. Avoiding payment default is difficult, and based on trust. While contracts do give more certainty, home renovation projects are so small, that it would not be worth the investment to run after one non-payment.
- **Time gap:** Contractors and suppliers prepare bids in a hurry, profit margins are low, resulting in not-enough tailored bids, not specific enough for the requirements of the customers. The margin of successful bids is low, which engraves further the reluctance to spend much time on preparing a project.
- **Information gap:** contractors do not have enough information about the potential project, the other contractors, while (under the time pressure) they can find it hard to stay up-to-date about the latest solutions and technologies.
- **Result gap:** the actual energy consumption and the predicted one usually differ. The final energy saving impact of the project depends on a large number of contractors, and it can be hard to showcase the impact of one. Furthermore, the effects can be cancelled out by behavioural rebound, or by external factors, such as energy price increase.

In summary, **the supply side of the renovation market is fragmented, coordination is ad-hoc, it is characterized by split incentives, lack of time, imperfect information, preference for easier (construction) projects, lack of innovation and up-to-date knowledge.**

2.4 Decision-making in home renovation

Between 41% (in Germany) and 87% (in Bulgaria) of the households have ever in their lives made an energy efficient refurbishment. Less than one third of them carried out an energy efficient renovation at least twice ([Ipsos 2018](#)). Therefore, grabbing the opportunity of the single or few occasions of renovation is imperative. Many years will pass until a next renovation will be likely ([Mortensen, Heiselberg et al. 2016](#)).

A decision to engage in an energy efficient renovation happens when a number of factors coexist and key barriers are eliminated or reduced. For a long time, pay-back times, energy cost savings, and rational approaches were considered as the drivers of these decisions, however other determinants are now seen as more consequential ([Gram-Hanssen 2014](#)).

The main motivators are ([Ipsos 2018](#)) (a) **general and thermal comfort** (keeping warm, keeping cool, providing a place for recharge, being convenient), (b) **saving money** and (c) ensuring a **healthier environment** (including noise particularly), (d) changing the style or giving a new look, or even simply (e) social pressure ([Risholt and Berker 2013](#), [Energy Club 2014](#)). In fact, energy efficiency per se is not the main driver, but an additional benefit ([Abreu, Oliveira et al. 2017](#)). On the other hand, citizens are **primarily held back by** (a) **money**, (b) **the (expected) hassle**, and (c) a **lack of (procedural) awareness**. These factors are much varied across countries ([Ipsos 2018](#)).

The key factors that influence the actual decisions are reviewed below.

Willingness versus realization

Interestingly consumer studies commonly identify a high willingness to home intervention and intention towards energy efficient renovations ([Wilson, Crane et al. 2015](#)).

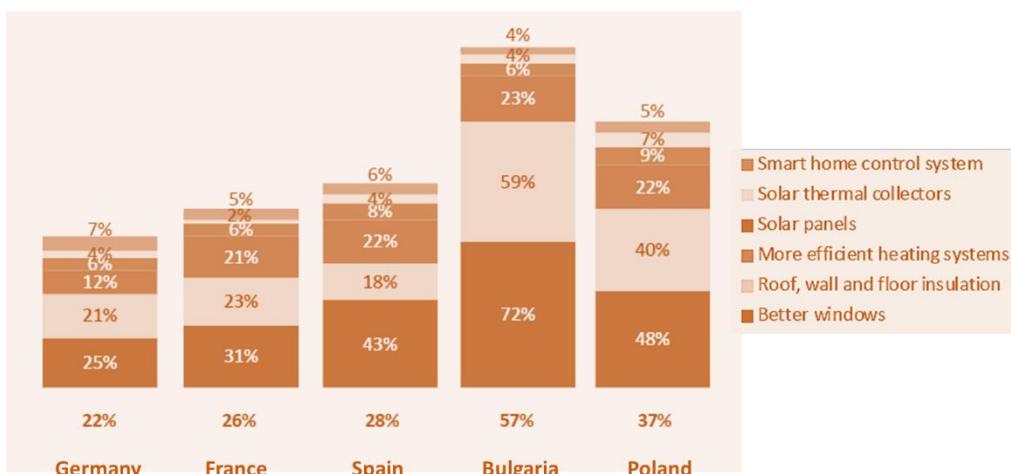
In a Danish study ([Mortensen, Heiselberg et al. 2016](#)) an average of 33% of the homeowners expressed great interest in energy renovating their houses, with a larger share (over 40%) among younger people. In a representative survey in 2014, Energy Club ([2014](#)) found that around 20% of the Hungarian households had plans of renovation in the following 5 years. Around half of the households reported that they planned to carry out the renovation in a “do-it-yourself” (DIY) mode, i.e. themselves or with the help of friends and family. The reasons for choosing DIY was to hold ownership ([Galvin and Sunikka-Blank 2014](#)) or to save money ([Energy Club 2014](#)).

While the renovation project may not be driven by the economic aspects only, financing is an obvious limitation. Finding suitable financing solution is a challenge for different reasons at different life stages. It can be difficult for young families as the first mortgage loan is used up to buy the property, and further loan is either not available for them or they are reluctant. Elder homeowners may be unsure of whether the investment will pay off during their lifetime ([Mortensen, Heiselberg et al. 2016](#)).

Type of renovation

It is also shown that homeowners are more often engaged in easier projects, such as in renewing appliances, or renovation projects that increase their comfort or aesthetics, e.g. kitchen or bathroom restructuring (see e.g. Figure 7). These also require smaller financial input.

Figure 7. Type of renovations in the surveyed countries. Note: all respondents = 6004



Source: ([Ipsos 2018](#))

The Hungarian Energy Club ([2014](#)) found that almost 50% of the households planned to refurbish their windows and door, 34% their facades and walls, and around 20% their heating systems.

Ownership

Owners living in their own dwellings are more likely to engage in an energy renovation. Ipsos has shown that the countries with the highest home ownership ratio had also the highest level of renovation ([Ipsos 2018](#)). Also, higher income households and households with families were found to be more motivated ([Ipsos 2018](#)).

Multi-apartment buildings face further complicated decision-making struggles, a complex ownership set-up (e.g. of the common area, the pipes, the façade), and an unbalanced split incentive from several perspectives. Legal parameters may underline or hinder regular maintenance and limit the alteration possibilities for multi-apartment communities ([Palm and Reindl 2018](#)).

Social considerations

Social housing offers opportunities to households that are less affluent. According to E-Coat Home project 30% of the Dutch inhabitants live in some kind of social housing ([Planbureau 2018](#)), and 68% of all dwellings are municipally owned rental apartments ([Palm and Reindl 2018](#)). However social housing is rarely concentrated to a neighbourhood or area, and they are mixed with private houses or dwellings. In the Netherlands, this is referred to as ‘gespikkeld bezit’, which roughly translates to ‘multiple/mixed ownership’ or

'speckled property distribution'. Generally, the private owner-occupied houses in these building blocks are not owned by wealthy residents, which limits their energy renovation investment possibilities, and further limits the overall energy efficiency improvement of the neighbourhood.

By improving the thermal performance of social buildings, tenants can save large percentage of their utility costs, thus end up with more disposable income ([Colclough, Kinnane et al. 2018](#)). At the same, tenants have reservations about on-going renovations. On one hand, it may be difficult for them to relocate for the time of the works. On the other hand, 60% of the respondents in the above mentioned European study ([Ipsos 2018](#)) were afraid of the higher rents after the landlord carries out the renovations.

Community, social pressure and knowledge

Placing the people in the centre of attention and understanding their relationship with other barriers and motivations could help us better understand how to promote renovations. Gram-Hanssen ([2014](#)) argue that social factors (neighbours, peers, social network) influence renovation decisions on energy efficient renovations. Ipsos ([2018](#)) found that people in rural areas are more influenced by their peers, and they tend to make renovations because others do it, they want their houses look better and because they want their houses to be equipped with the latest technology.

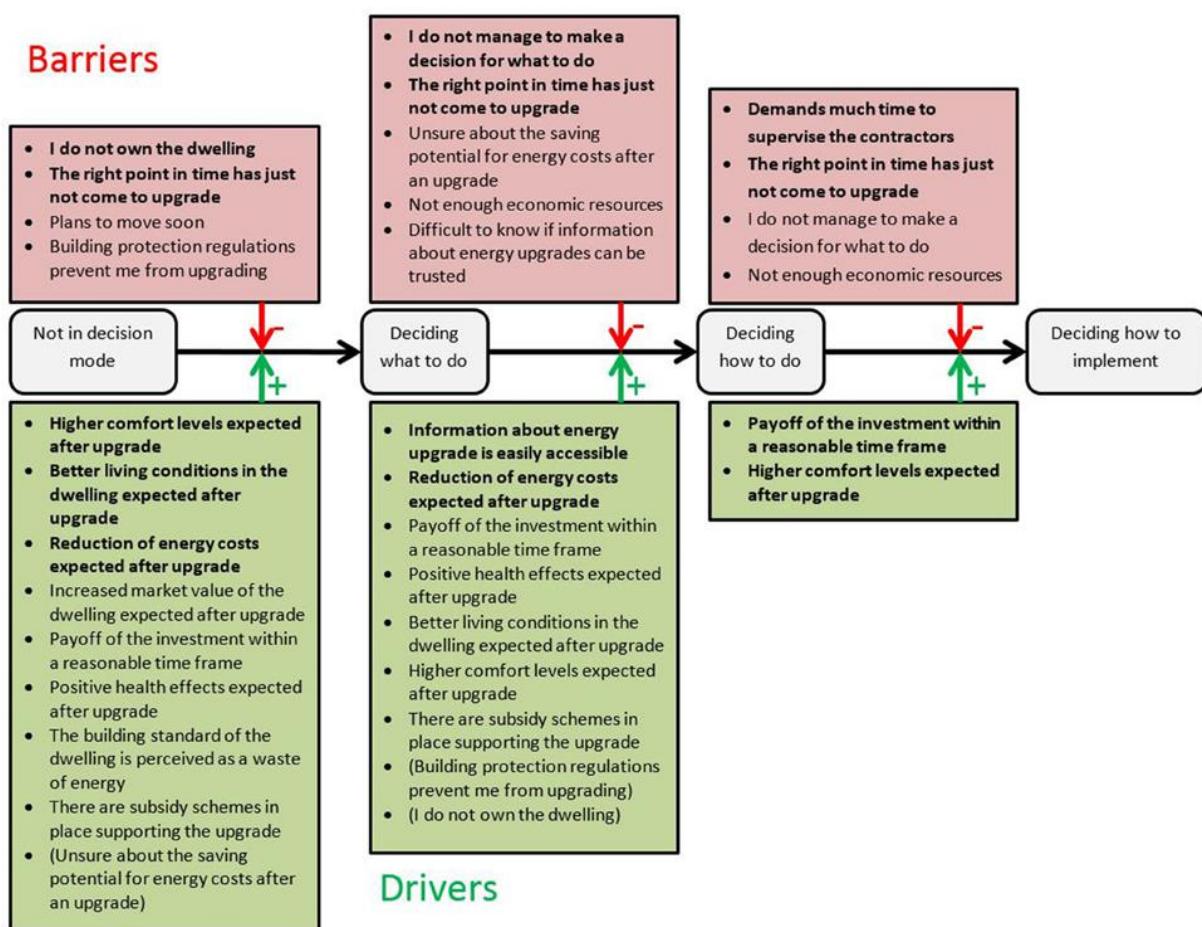
Timing

Timing of energy renovation is quite typically linked to ownership or usership transfer. Homes are usually empty and go over general prop-up, therefore the chances to integrate energy efficient elements into these works is likely to be successful.

Moving or redesigning home was found to influence not only the technical renovation quality (and related decisions), but also to offer a possibility for change habits ([Stephenson, Barton et al. 2010](#), [Gnoth 2013](#)). Gnoth ([2013](#)) explored different types of households in very different context (from students moving to their own home to a family moving to a cheaper house), and found that the move was an opportunity to develop routines that boost the technical solutions. It is notable that the change may not necessarily be more energy efficient, but also more energy wasteful in spite of the renewed technological solutions due to rebound effect. In line with earlier studies ([Schäfer, Jaeger-Erben et al. 2012](#)), it was found that interventions were underperforming because a move or a renovation occupies too much of the efforts of the actors of the renovation, who have too little strength left to focus on developing future norms. This is an area, which could be influenced.

Interested citizens often abandon the renovation idea before realizing it. There are critical decision-making stages, where a potential renovation can get discouraged or motivated. Many of them could be overcome if the owners were given help through the renovation process and in decision making (see Figure 8).

Figure 8. Overview of the structure of barriers and motivators at different stages of the decision making for a building renovation.



Source: ([Klöckner and Navum 2016](#))

Regularity

Wilson, Crane, & Chrysochoidis (2014) also argue that energy-efficient renovation should be considered as a fluent part of everyday life, rather than an extraordinary event. Gram-Hanssen (2014) also came to similar conclusions using a survey among Danish house owners: the renovation of kitchens and bathrooms often has higher priority than energy efficiency, and the financial situation influenced the choices about the renovation only to some extent. Many decided to renovate even in the lack of financial resources, using do-it-yourself solutions, if necessary. Convenience and comfort were found more influential in the adoption of heating systems by Michelsen and Madlener (2013).

2.5 Current policy framework of the renovation market

Policies were pivotal for the growth in the renovation market in the last 10 years. In particular, the recovery measures responding to the financial and economic crises were important, making the renovation market as one of the beneficiaries of the post-crisis reaction. In particular, the redirection of EU Structural Funds and other national/local funds to alleviate citizen's burden helped to support the construction industry in many countries, resulting in improved building stock and more jobs. International funds (ERDF²¹, CF²², EIB²³, etc.) have also supported extensively energy efficiency improvements. However, austerity measures in some MSs had the opposite effect, especially with a stringer regulation on residential loans, which ultimately discourages investments, while also reducing payment default and limit household indebtedness ([Zancanella, Bertoldi et al. 2018](#)). Besides, the increasing stringency of regulations (mainly standards) around Europe, the

²¹ European Regional Development Fund

²² Cohesion Fund

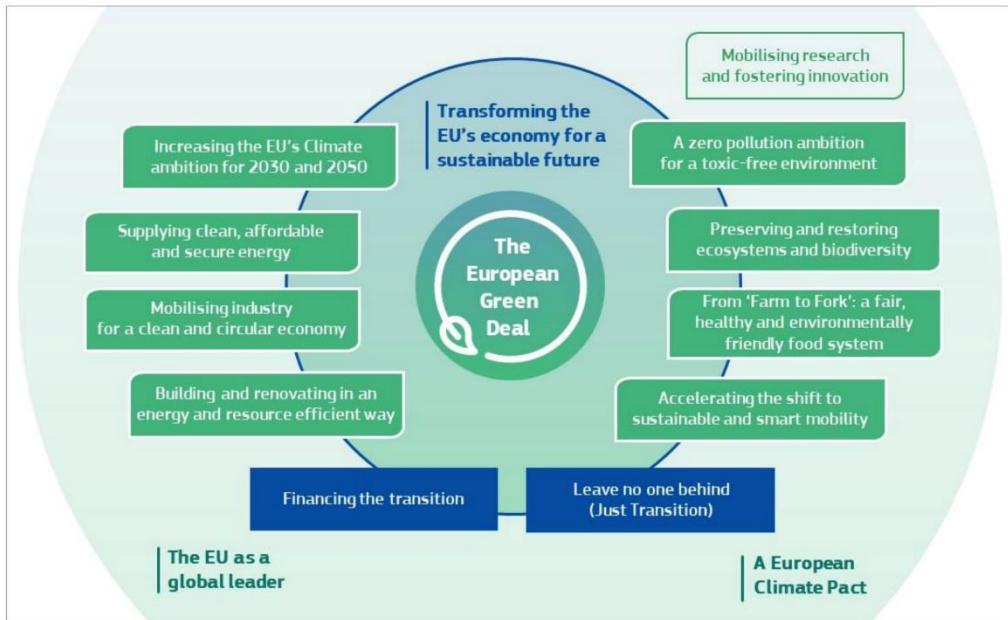
²³ European Investment Bank

prevalence of financing instruments is typical in the renovation market. Note that the renovation market depends very much on loans and mortgages ([Bertoldi, Economidou et al. 2020](#)).

2.5.1 The European context

The Paris Agreement²⁴ and the Agenda 2030²⁵ initiated a nearly universal global action for climate and other environmental, social and economic goals, where the EU has revived as a global leader. The recent European Green Deal is a response to the multitude of challenges linked to climate, resources, energy, economic competitiveness, focused on the quality and efficiency of services in the light of citizens' well-being, while taking into account a circular economy approach, minimization of pollution, and just transition.

Figure 9. Key elements of the European Green Deal



Source: EC ([2019](#))

Implementation is buttressed by legislative measures as part of the "Clean Energy for All Europeans" package²⁶. Four of the eight proposals were adopted by the end of 2018, which are expected to stimulate Europe's industrial competitiveness, boost growth and jobs, reduce energy bills, help tackle energy poverty and improve air quality (see Table 8). The relevance of the legislative changes for building renovation and OSS are the following:

- The Energy Efficiency Directive (EED, 2012/27/EU) established a set of binding measures to help the EU reach its 20% energy efficiency target by 2020. The 2012 Directive required Member States to set up measures to ensure a more efficient energy use at all stages of the energy chain, from production to final consumption. Member States were required to renovate every year 3% of public buildings owned and occupied by central governments with an area above 250m². They were also required to draw up road maps for building renovation by 2050. The EU target was revised in December 2018 to 32.5% energy savings in 2030 (see above). Furthermore, the annual energy saving obligation beyond 2020 was extended, and rules to increase transparency for consumers, especially in multi-apartment buildings were strengthened.
- On July 9th 2018, a significantly revised version of the Energy Performance in Buildings Directive (EPBD, 2010/31/EU) came into force²⁷. The EPBD is the EU's most important legislative tool for energy efficiency in buildings, under which Member States must implement minimum energy

²⁴ <https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement>

²⁵ <https://www.un.org/sustainabledevelopment/development-agenda/>

²⁶ <https://ec.europa.eu/energy/en/topics/energy-strategy-and-energy-union/clean-energy-all-europeans> (30th November 2016)

²⁷ https://ec.europa.eu/info/news/commission-welcomes-council-adoption-new-energy-performance-buildings-directive-2018-may-14_en

performance requirements for new and existing buildings. The EPBD is an important stepping stone to a decarbonise the building stock by 2050.

In its preamble (#16), the EPBD calls for improved financing of buildings, and for one-stop shops to be utilized as advisory and assistance tools. The EPBD is extended with a new article, Art. 2.a. calling for long-term renovation strategy, as part of which Member States are required to facilitate access to mechanisms, such as one-stop shops, which are considered as advisory tools here to inform and assist consumers in relation to energy efficiency renovations and financing instruments. According to the revised EPBD Article 20(2), “Member States shall provide the information through accessible and transparent advisory tools such as renovation advice and one-stop shops”.

- The revision of the Renewable Energy Directive was also completed in December 2018. The provisions that help consumers advance to become prosumers are specifically relevant for the discussions about buildings’ energy renovation.

Table 8. Four of the eight political agreements under the “Clean Energy for All Europeans” package were successfully adopted in 2018.

Legislative proposal	European Parliament adoption	Council adoption	Official Journal publication
Energy Performance in Buildings	17/04/2018 ²⁸	14/05/2018 ²⁹	19/06/2018 - Directive (EU) 2018/844 ³⁰
Renewable Energy	13/11/2018 ³¹	4/12/2008 ³²	21/12/2018 - Directive (EU) 2018/2001 ³³
Energy Efficiency	13/11/2018 ³⁴	4/12/2018 ³⁵	21/12/2018 - Directive (EU) 2018/2002 ³⁶
Governance	13/11/2018 ³⁷	4/12/2018 ³⁸	21/12/2018 - Regulation (EU) 2018/1999 ³⁹

Source: based on various sources

Alongside the legal changes, the amount of public funds has been increased and tailored for direct investments⁴⁰, for research and market preparation, etc. Specifically, for energy efficiency financing for buildings, the European Commission launched the “Smart Finance for Smart Buildings” initiative in November 2016 to unlock private financing for energy efficiency investments in buildings (mentioned above). In October

²⁸ http://europa.eu/rapid/press-release_IP-18-3374_en.htm

²⁹ http://www.consilium.europa.eu/en/press/press-releases/2018/05/14/energy-efficient-buildings-council-adopts-revised-directive/?utm_source=dsms-auto&utm_medium=email&utm_campaign=Energy+efficient+buildings%3A+Council+adopts+revised+directive

³⁰ https://eur-lex.europa.eu/legal-content/EN/TXT/?toc=OJL%3A2018%3A156%3ATOC&uri=uriserv%3AOJL_2018.156.01.0075.01.ENG

³¹ http://europa.eu/rapid/press-release_IP-18-6383_en.htm

³² https://ec.europa.eu/info/news/commission-welcomes-council-adoption-new-rules-renewable-energy-energy-efficiency-and-governance-2018-dec-04_en

³³ https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJL_2018.328.01.0082.01.ENG&toc=OJL:2018:328:TOC

³⁴ http://europa.eu/rapid/press-release_IP-18-6383_en.htm

³⁵ https://ec.europa.eu/info/news/commission-welcomes-council-adoption-new-rules-renewable-energy-energy-efficiency-and-governance-2018-dec-04_en

³⁶ https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJL_2018.328.01.0210.01.ENG&toc=OJL:2018:328:TOC

³⁷ http://europa.eu/rapid/press-release_IP-18-6383_en.htm

³⁸ https://ec.europa.eu/info/news/commission-welcomes-council-adoption-new-rules-renewable-energy-energy-efficiency-and-governance-2018-dec-04_en

³⁹ https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJL_2018.328.01.0001.01.ENG&toc=OJL:2018:328:TOC

⁴⁰ The European Structural and Investment Funds (ESIF) of 18 billion EUR between 2014-2020 is considered to be the most important financing stream in Europe for energy efficiency, indicating a tripling compared to the previous period. However, there are other European sources, such as the European Energy Efficiency Fund, the Private Finance for Energy Efficiency, EIB funds, etc. See more in the Impact Assessment SWD (2016) 414 final, Accompanying the Proposal for a Directive of the European Parliament and of the Council amending Directive 2010/31/EU on the energy performance of buildings.

2020⁴¹, the Renovation Wave initiative has been launched with the specific aim to promote building renovations. While constraining the direct funding, innovative financing alternatives are under development.

2.5.2 National and local policies and measures for home renovation

There are already a number of good examples of policies and measures at national and local level that promote energy renovation of residential buildings ([Artola, Rademaekers et al. 2016](#)), even though only building codes/standards have proven to have a sector-wide impact. Subsidies and direct grants can easily boost the renovation rate and the depth if designed accordingly, however they are too costly and support a lot of free riders. Various information measures (awareness raising programmes, labels) can be effective in motivating building owners and users, but on one hand they remain typically general or if tailored they become very expensive, while the financial barriers remain intact and thus these can only have a limited impact on the market as stand-alone measures.

As will be shown in chapter 3.2, several of the limitations of the existing policies and measures can be overcome by a functional market of one-stop shops. Therefore, policies that support this market may become an integral and useful part of the policy package.

⁴¹ https://ec.europa.eu/energy/sites/ener/files/eu_renovation_wave_strategy.pdf

Table 9. Overview of national and local policies that are used in relation to home renovation in European Member States.

Policy	Barriers addressed	Scope (in case of EU policies)	Costs	Extent of impact on renovation rate	Extent of impact on renovation depth	Extent of impact on behaviour	Other comments
Building codes and MEPS	Regulatory	All: -residential and non-residential - new and some renovation	Medium (mostly related to the operational framework)	No impact	High (depending on stringency of requirements, coverage and enforcement)	No impact	Increasing stringency and coverage makes a smoother impact
Refurbishment obligations	Regulatory	Existing buildings	Low-medium (depends on monitoring scheme)	High (depending on stringency of the target and coverage)	No impact	Small, indirect	Increasing stringency and coverage makes a smoother impact
EEOs	Financial	All buildings (and energy use)	Medium (majority of cost is borne by utilities, but the framework and enforcement can be costly)	Potentially high, but dependent on the types of measures, and likely to diminish over time	Typically counterproductive because of cherry picking.	Potentially high, depending on the measure design and content	Risk of cherry picking
Subsidies & other FIs	Financial	All buildings	Very high (direct subsidies) to high (loans, revolving funds)	Potentially high dependent on the policy design and coverage	Potentially high dependent on the policy design and coverage	Potentially high, depending on the policy design and coverage	Risk of free riders Less direct subsidies are preferable
Research and development programmes	Technical Awareness	/ Demonstration projects or indirectly all	Low	No or limited/delayed impact	limited/delayed impact		Uptake is often slow due to low inertia of the sector
Fiscal incentives	Financial	All buildings	Very high or high (depending on scope and level)	Potentially high (depending on the incentive requirements and enforcement/ monitoring)	Potentially high (depending on the incentive requirements and enforcement/ monitoring)	Potentially medium, depending on the design	Risk of free riders
ESCos	Financial Process	/ All buildings	Low	Low to medium depending on the related measure and/or the market volume	Typically low or counterproductive, unless linked with other policies	Typically low or counterproductive, unless linked with other policies	Varied options for policy promotion, design has large impact
Energy audits	Technical Awareness	/ All buildings	Very low	Usually low	Medium	Usually low, unless specific attention on users	Risk of measures not being implemented

Policy	Barriers addressed	Scope (in case of EU policies)	Costs	Extent of impact on renovation rate	Extent of impact on renovation depth	Extent of impact on behaviour	Other comments
Awareness information campaigns	Awareness & Awareness	All buildings	Low-medium (depending on the design)	Potentially low (depending on the measure design, content and reach)	Potentially low (depending on the measure design, content and reach)	Potentially low-high (depending on the measure design, content and reach)	Hard to prove / isolate the impacts
Voluntary energy labels	Awareness	All buildings	Low	No impact	Low (depending on the coverage, awareness, interaction with other policies)	Usually no impact	Risk of negative interaction with other policies or replication
Ecodesign, energy labelling, EPC	Awareness	All buildings and building parts and equipment	Medium (due to operational capacity requirements, testing, and enforcement)	No impact	Low-medium (depending on the coverage, awareness, interaction with other policies)	Usually no impact	Likely positive interaction with other policies (esp. MEPS and awareness policies), while risk of overlap
Voluntary agreements	Process	Buildings from housing associations	Low	Medium (depending on the extent of the programme)	Medium (depending on the target)	Possible (dependent on measure design)	Need commercialised market
Skills and capacity building	Technical Awareness / Awareness	All buildings via construction industry	Medium	No impact	Low-medium	No impact, or only indirect	Lapsed impact

Source: ([Boza-Kiss, Moles-Grueso et al. 2013](#), [Artola, Rademaekers et al. 2016](#))

3 One-stop shops: holistic integrated home energy renovation services

Demand side improvement measures are **fragmented both on the demand side (many customers with widely ranging preferences and characteristics) and the supply side (many and small contractors mostly with unknown quality, wide range of technical and managerial solutions, countless combination of technical variables)**, which makes it difficult for both sides to choose the best partners (Figure 10).

Figure 10. It is difficult to manage a renovation project for an average homeowner. The hassle, complexity and time are discouraging



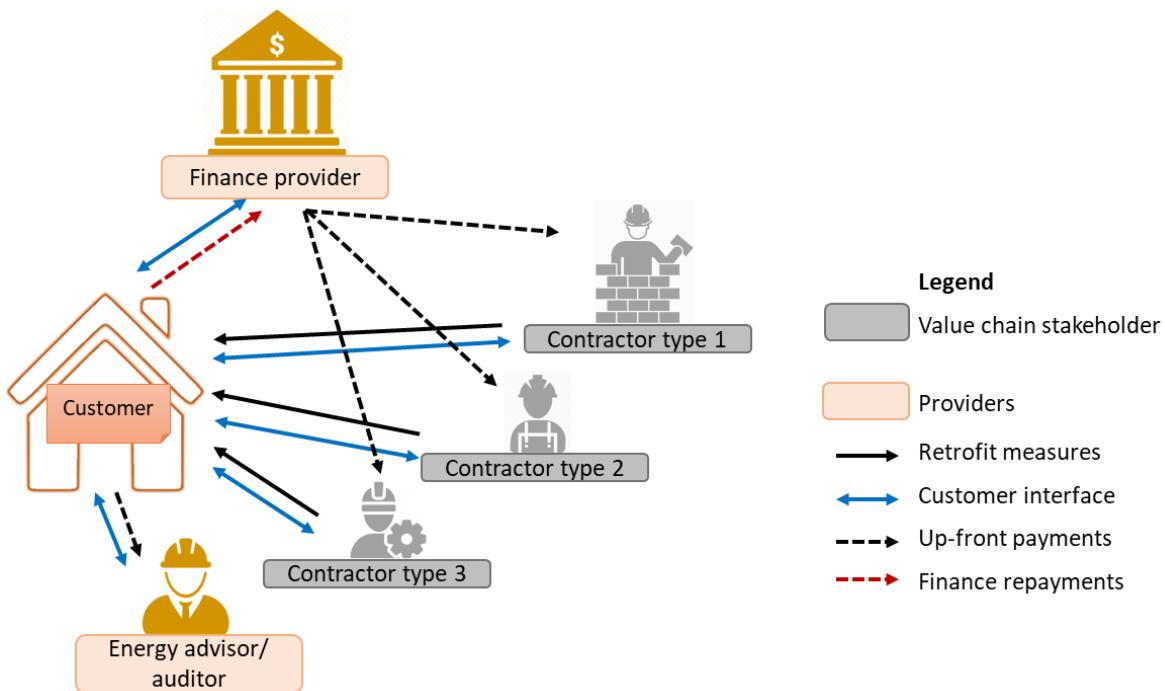
Source: Graphics by Sziptner, G. published in ([Csoknyai, Barna et al. 2013](#))

As shown above policies have been spurring the overall improvement of the building stock through measures directed towards new buildings, while little has been effective on the side of existing buildings. In this context the one-stop shop concept comes as an opportunity on the market to enter a niche area if the model is designed and priced appropriately. For policy-makers this means understanding the OSS segment, and find ways to support it in order to enhance its potential for increased volume and depth of building renovations.

3.1 What is a home renovation one-stop shop?

The **classic renovation model, referred to as “atomized model”** by Brown ([2018](#)), requires the customer to make all major decisions, keep in touch with all suppliers and partners involved, invest a lot of time and take risks. The success of the renovation depends on the ability of the customer to act as a project manager/organizer in terms of technical, financial and time-management. But this customer is typically not educated in building renovation and project management, and thus runs a high risk of timing, financing and quality problems (Figure 11).

Figure 11. The atomized market model with financial provision



Source: Own graphic based on Brown (2018)

Throughout history, new business models have been instrumental to the diffusion of new solution, new technologies and new systems (Teece 2010). Supplying **complex products and systems (CoPS)** rather than individual products or services (Slywotzky (1996), Sharma and Molloy (1999), Davies et al.(2001)) can reposition businesses, while providing customers more tailored, “**integrated solutions**” (Brady, Davies et al. 2004). Offering “integrated solutions” enables the manufacturers, service providers, and new entrants to capture a **market niche**, where they meet the customers’ specific requirements ranging from individual packages to full service solutions.

Such “integrated solutions” emerged largely in the 1990s, starting in the IT sector, which was creating more and more complex systems that became too complicated to be easily understood by general customers. Construction and renovation provision with energy performance improvement is going through a similar transition, where **complex, fragmented offers can be integrated into offers of higher value proposition, and through which a supplier can better position itself**.

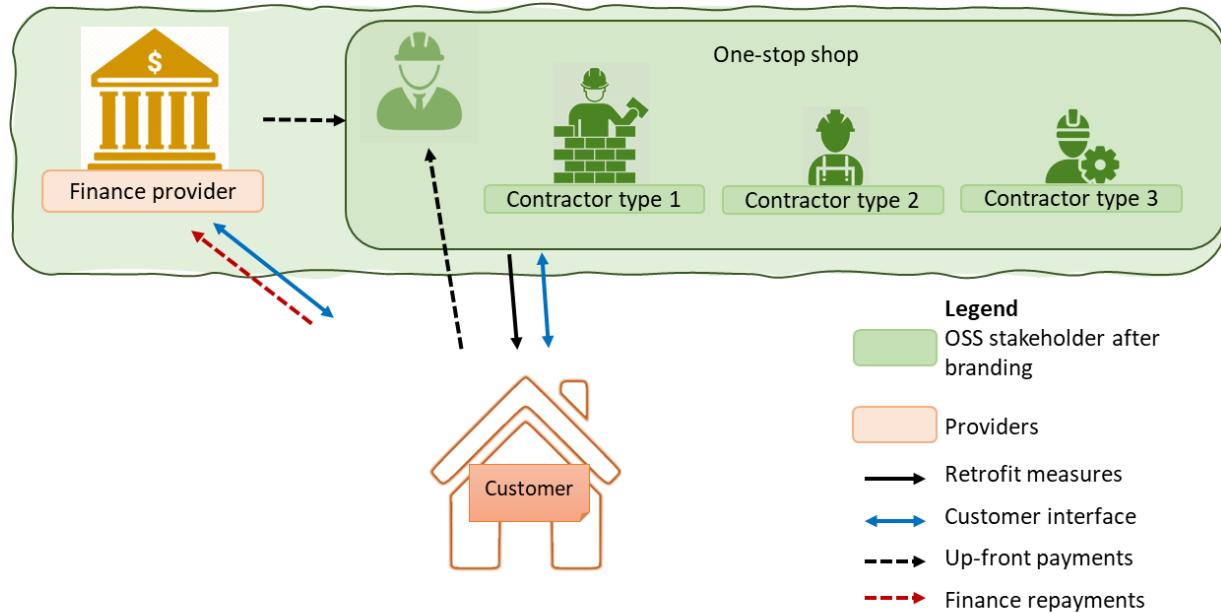
In addition, other terms are used to refer to the same concept of “**one-stop shop**”, such as “**Competence House**” (e.g. (Bolig Enøk 2012)), “observatory” – in case of a central information tool that supplies many types of related data, or “**turn-key service**” – in the construction/energy supply services.

According to the Financial Dictionary, “one-stop shops” aim to attract customers and clients by allowing them to save the time and energy they would otherwise spend going to different companies for different activities.³³

⁴² Financial Dictionary. n.d. <https://financial-dictionary.thefreedictionary.com/One-Stop+Shop>

As opposed to the “atomized model” (Figure 11), **in the one-stop shop model, the OSS stands in the middle** of an energy renovation stakeholder map and subcontracts all other contractors, occasionally even the financial actor (Figure 12). The OSS practically **represents and manages the whole (or large part) of the customer chain**. The customer receives **all information, all contract, all management** from the OSS.

Figure 12. The One-stop shop model



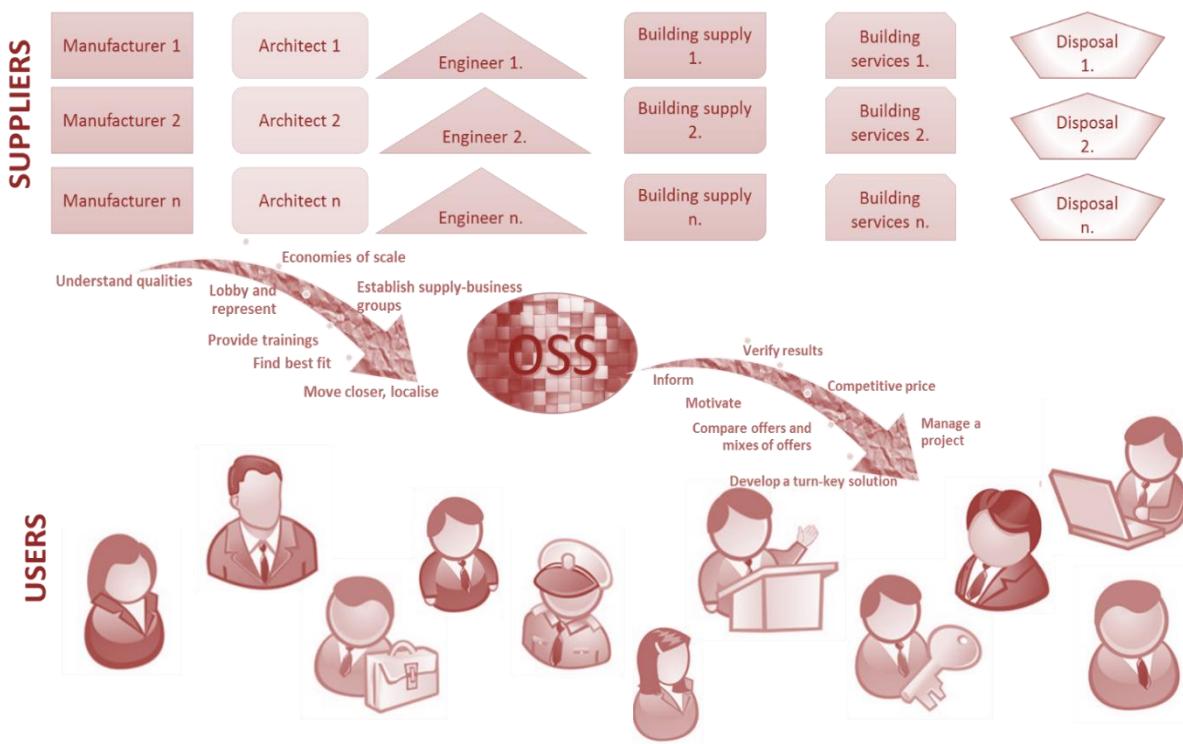
Source: Own graphic based on Brown (2018)

3.2 The value proposition: The OSS service offer

The role of an OSS is many-folded and varies depending on the specific situation. In general, we can consider it as an **intermediary point of contact** (Figure 13) that translates the fragmented supply side, e.g. designers, suppliers, installers, financiers into one offer to the homeowners. On the other hand, the one-contact point is also valuable for the suppliers, who often find it difficult to manage the transactions towards their potential clients due to the varied requirements, lot of resources for awareness raising, extra visits and/or visits to customers who will finally not contract them, etc.

From a **customer perspective**, the “integrated solution” becomes a “one-stop shop” (OSS) service in the buildings sector, when asset owners that would like to realize energy renovation of their buildings are aided in more than one/few steps in the process. An OSS service transforms a cumbersome and complex set of decision-making/actions by non-experts into a single entry, customer-friendly offer. The OSS concept means moving away from the **classic set-up where asset owners face directly every entry point of a complex renovation value chain with a number of interlocutors**, and where the asset owner – who is a non-expert – **has to find the best combination of the parts of a complex solution**, to a situation where project promoters can benefit from a **customer-centred service offer establishing a bridge between the fragmented supply side and the also fragmented demand side**.

Figure 13. The intermediary role of OSS, and some of the benefits and advantages it can offer to both sides

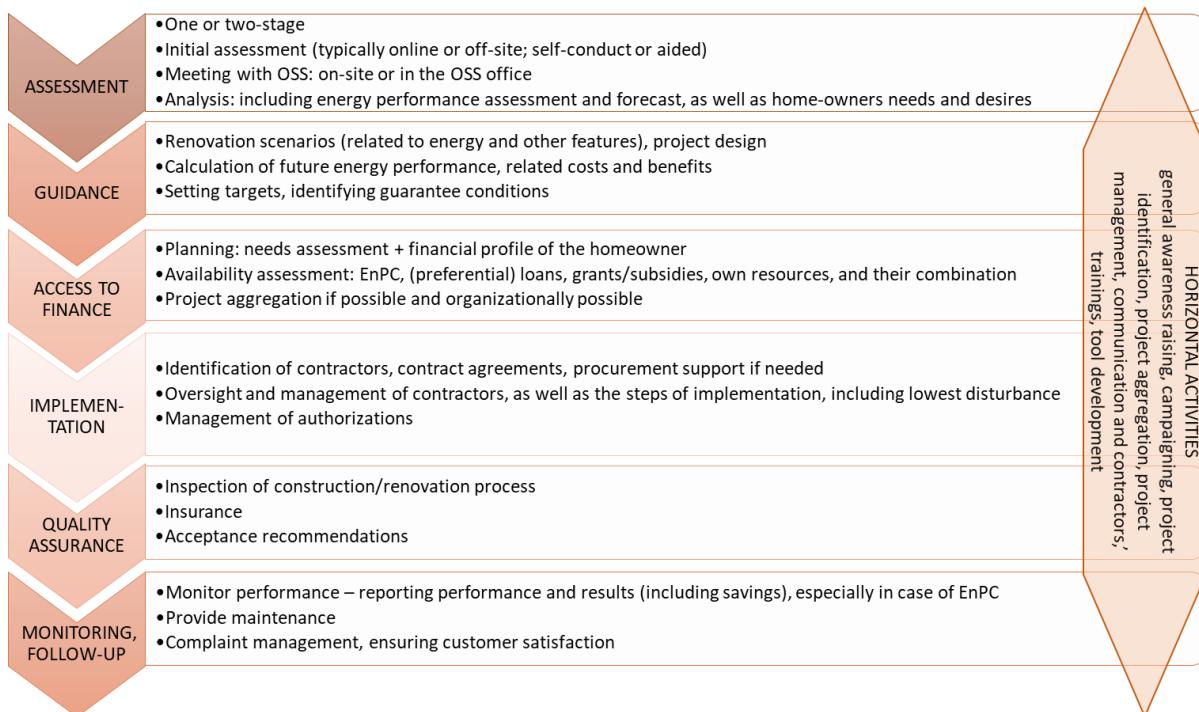


Source: Own graphic⁴³

The value proposition of the OSS services for different stakeholders are reviewed in chapter 3.3, and clearly offer benefits for not only the home owners, but also for contractors. **The offer of OSS at the customer value chain points range from information, technical and legal support, structuring and provision of financial support, to the monitoring of savings** (Figure 14).

⁴³ Source of the icons: <http://gfx9.com>.

Figure 14. The full service value chain for homeowners



Source: own graphic based on various sources

3.3 The benefits and limitation of working with an OSS

Based on the data collection and survey among OSS⁴⁴, the critical benefits and limitations of developing a project with an OSS are reviewed below from the perspectives of the demand side (home owners) and the supply side (contractors and financiers).



The clients' perspective

Advantages	<ul style="list-style-type: none"> » Tailored information and recommendations: on the current and potential energy consumption and energy savings; » Avoiding hassle: OSS takes over the organisation and the management of the renovation project from the client; » Simplified process: OSS is a single point of contact, (often⁴⁵) a single point for payment, the client does not need to arrange with numerous service/product providers; » Access to reliable information: OSS has the technical and financial knowledge that are required for the renovation project; » Higher quality: as a result of the previous point, and because of collaboration with local tested and trusted contractors, OSS can achieve higher quality in project performance on average, moreover many OSS include quality control and monitoring (or even verification) in their services; » Faster renovation: usually an OSS-mediated project is completed faster,
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⁴⁴ The survey methodology is reported in Annex I.

⁴⁵ About half of the OSS work on a fee-basis, and while select and instruct the subcontractors, the client still have to conclude contracts with these individually. See more in chapter 4.3.

	<p>because of the experience of the OSS (whereas the client does not have to explore alternatives), because of the partnerships between the OSS and the contractors (based on which the contractors are available to complete the works), and because of specific technologies used in scale (see e.g. the one-week renovation by EnergieSprong);</p> <ul style="list-style-type: none"> » Tailored financing package: the OSS often establishes partnerships with financing organisations, which are referred to the client (e.g. BetterHome), or provide their own financing options (e.g. Oktave), but in any case help to plan the financing structure of the project by evaluating the resources needed and the source options, and prepare the application where necessary (for grants, for loans, etc.).
Limitations	<ul style="list-style-type: none"> » Costs: the service of the OSS is costly. OSS either charge a fee (see more in chapter 4.3) or build the costs into the overall price of the package (nevertheless, due to economies of scale, the OSS may have access to lower priced renovation costs than an individual would); » Driven choice: the selection of contractors is predefined by the OSS, and more restricted than the whole market, thus the client has less control.



The contractors' perspective

Advantages	<ul style="list-style-type: none"> » Improved knowledge and skills: OSS and their partners often provide trainings to contractors (see Table 15); » Access to small projects – overcoming the fragmentation of the buildings sector: projects that are normally financially not viable become accessible for contractors, because the OSS takes over much of the transaction costs (e.g. project preparation, feasibility study is carried out by the OSS, client identification has a higher rate of realisation), furthermore, OSS can bundle small projects to reach economies of scale; » Brand and reputation: OSS represent a brand that they build up and advertise, and to which the contractors join when partnering with the OSS and thus enjoy the recognition and trust; » Business support: linked to the above point, the OSS represents the contractors at fairs, industry circles, provides customer care, organises advertisements, etc. These all improve contractors' recognition; » Tools: Some OSS develop support tools (such as calculation tools, installation, monitoring tools) to aid the work of the contractors at the premises of the renovation; » Partnering and networking: the OSS structure offers safe environment for the contractors to collaborate with others, and the quality control and certification of each of them improves trust among the network.
Limitations	<ul style="list-style-type: none"> » Availability pressure: the advantage of being referred to projects is also a limitation – contractors are required to be available for projects identified by the OSS; » Costs: the price of the contracts are set ahead in agreement between the OSS and the contractor and driven also by internal competition; » Internal competition: the contractor is in competition with other contractors in the OSS network; » Competition from independent contractors: this is a less significant concern, because independent contractors typically are not interested in the types of projects an OSS works with.



The financiers' perspective

Advantages	<ul style="list-style-type: none">» Access to new types of projects: home renovation is typically financed from personal loans, however this is limited by liquidity and the financial capacity of the homeowners. An OSS project can be made available for other financial products (e.g. mortgages, green loans, etc.);» Aggregated projects: financiers have access to pools of clients with similar conditions and requirements, which enables the development of standardized products;» Lower transaction costs: small projects have relatively too large transaction, but in an OSS-assisted project, the bank can trust the technical evaluation of the OSS and/or the OSS may pool projects together;» Improved applicants: some OSS help their clients fill in loan applications, and thus improve the correctness and success rate of applications;» Reduced (perceived) risk: these (small) renovation projects with homeowners are traditionally considered risky, however understanding the nature of energy savings can increase trust in the increase of disposable income of applicants.
Limitations	<ul style="list-style-type: none">» Costs: collaboration with new actors (such as the OSS) has costs in terms of networking, skill development, new staff» Need for new products: banks need to develop new products, which is also an opportunity, while being a risk, too.

3.4 Alternatives to OSS

Several studies found that **OSS services did not develop in spite of expectations**. In simple words, OSS are not the silver bullet for all clients, for all locations and for all frameworks. Pardalis ([2019](#)) interviewed 10 Swedish SMEs that work in the construction sector to understand their desire to engage in offering one-stop shop services. While these existing construction companies **all thought that the OSS model is an interesting one** for the Swedish renovation market, and they **would appreciate the existence** of such an entity, they **did not see themselves as suitable** to offer these services. The interviewees thought that an OSS would be able to strengthen the market by fortifying the position of current stakeholders, expanding their networks, etc. At the same time, working as an OSS was conceived as too complex with a lot of risks and uncertainties. At the macro level, Mahapatra and colleagues found that in spite of the interest in Sweden in step-wise home renovation primarily among young, urban based, high income population, an OSS service offer is not available. Potential service providers were found to be not willing to take on the role. The few intermediary entrepreneurs are engaged with multifamily building construction, other SMEs and renovation companies would need business development capacities and knowledge, while the municipalities consider their role only as a facilitator ([Mahapatra 2019](#)).

Services that are similar to those offered by an OSS should be clearly distinguished. This is important for being able to better understand the role of the alternatives, to ensure transparency in the market, to avoid free-riders, to prevent false expectations from the clients, and to formulate relevant policies. A comparison with Energy Service Companies (ESCOs), with facilitators/advisors, and with consultants is provided below.

The Innovate project compared the OSS to a large number of other market actors from the viewpoint of that each of these market players occupy in the value chain as opposed to an OSS (see Figure 15).

Figure 15. The role of certain market actors in the renovation value chain.



3.4.1 ESCOs vs OSS

Energy Performance Contracting (EnPC) offered by an ESCO is a service, centred on the achievement of guaranteed energy savings. A third-party (the ESCO) enters into arrangements with property owners to improve energy efficiency of their site/building by implementing a set of measures that are defined by them (even if in consultation with the owners).

ESCos take on some or all of the risks, and their fee is paid from the energy /utility cost savings or at least based on the performance of the implemented measures. ESCOs may also finance or arrange for financing for the projects. ESCOs often keep the operation of facility and/or provide the energy supply for an agreed period of time. ESCOs typically act in the industry and the public sectors because of larger project sizes and more reliable energy consumption patterns.

In principle, ESCOs are not involved in awareness raising, motivation and follow-up of projects only to the level that allows them to maximise their profits.

The OSS concept is slightly different although it presents many similarities. OSS usually assist building owners throughout the entire renovation process, like many ESCOs. They manage the project and take on several types of risks, again similar to ESCOs.

However, OSS have a strong role in general knowledge sharing, raising awareness, and convincing homeowners to commit to energy efficiency improvements. They will offer pre-defined packages of renovation options, and/or work with building blocks of renovation measures that can be fit and fixed for the clients. They collaborate with local suppliers, and help the client select from the list of possible contractors based on competitive offers and/or an OSS-managed quality assurance. Mostly, the OSS compiles the offer, which they sub-contract, and the client is only facing one contractor and one invoice at the end.

OSS also offers benefits for the suppliers, whom they can train, support with tools, or other means, which is not the case for ESCOs. Accordingly, OSS are willing to work with small clients, such as single family houses or multi-apartment buildings.

EnPC and the OSS can be combined, and an ESCO may be interested in entering into the OSS niche, and by investing resources in the customer-care part of the value chain, attract more contracts on this fragmented market.

3.4.2 Facilitators vs. OSS

Facilitators can be of many kinds, and their level of involvement in the renovation project itself is varied. The Belgian super ESCOs and ESCO associations (such as Belesco, or the recently dissolved Fedesco) have a long history in facilitating EnPC or other renovation activities. In France, municipalities act as key actors to facilitate different models, including OSS (e.g. Picardie Pass) ([Refabert 2019](#)), in Sweden the municipality of Växjö plans not to offer an OSS service itself, but to facilitate its operations.

Facilitators help to arrange financing for the operation, and may participate only in part of the whole process. They are somewhat similar to an OSS from this perspective, but unlike a simple consultant. Energy advisors usually walk very closely with the client, and develop the advice exactly based on the customer's needs and situation, while it is more common that OSS have a few basic packages and tailor these to the specific case.

3.4.3 Consultants vs. OSS

Traditional energy consultants may walk the client through a longer process of the renovation project, but they will rather focus on shorter frames (e.g. audits, feasibility studies, follow-up monitoring). They are probably even more independent from brands, than some OSS. This is to say that many OSS will focus on being fully independent, but one of the roles of OSS is to help the client select from contractors. For this purpose, they either use their previous experiences, develop a list of suppliers and/or train and qualify the suppliers. Some OSS are directly linked to industrial partners (e.g. BetterHome). At the same time, OSS often guarantee the quality of the service, while energy consultants do not.

Energy consultants do not finance or arrange financing for the operation, as opposed to the usual OSS element. Consultancy is very tailored, yet less comprehensive than a facilitator and/or an OSS.

3.4.4 Combinations with other services

Some OSS identified, especially in the UK (for example Allenergy and TIG) **take on tasks that go beyond a renovation project**. For example, they help to alleviate some difficulties faced by vulnerable and marginalized households. Besides assisting them in a full home renovation, they are also available for simple behavioural energy saving measures, health improvement measures, or even money management advice (see e.g. Figure 16).

Figure 16. The schematic representation of Allenergy's offerings for local households and communities as an OSS

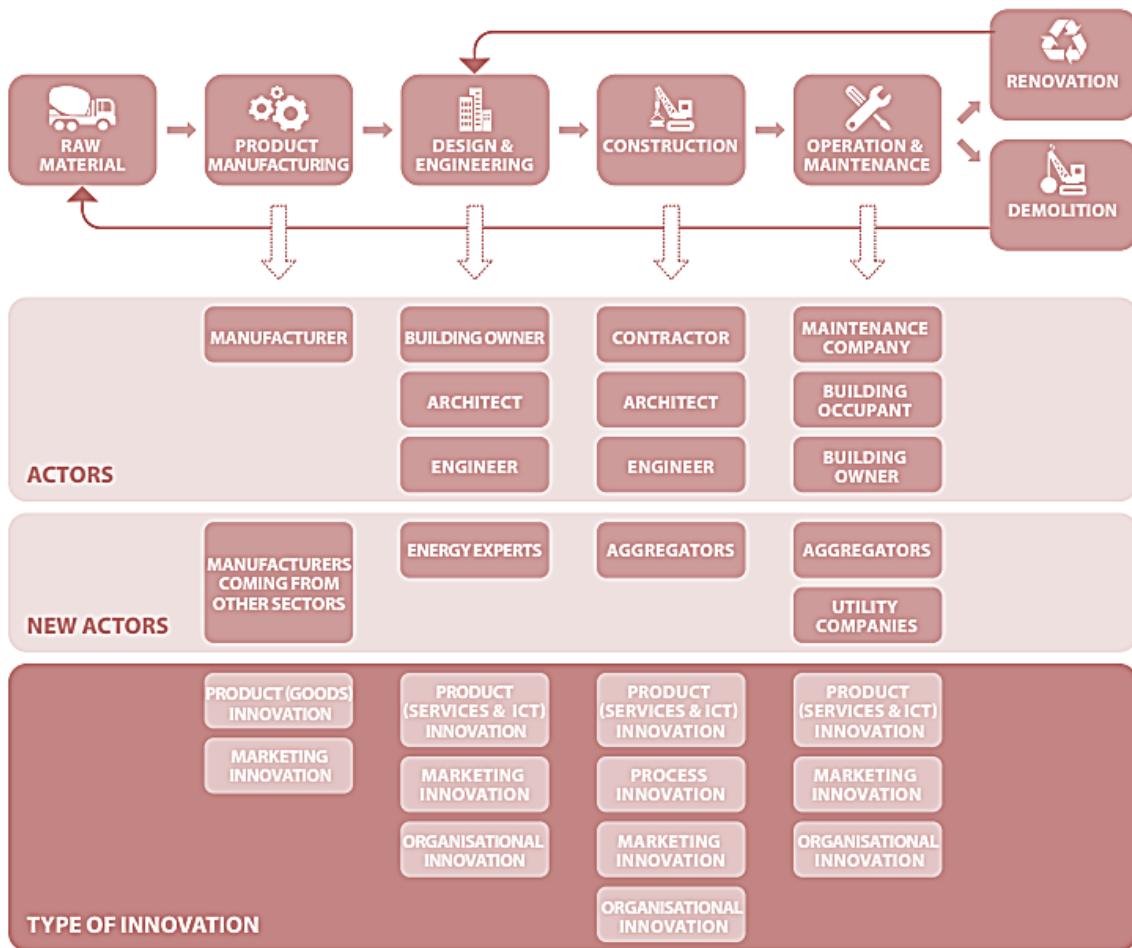


Source: <https://www.alienergy.org.uk/affordable-warmth/>

3.4.5 Innovation and home energy renovation

There is a good place for “one-stop shops” in almost any value chain related to energy efficiency. The following graph shows the construction value chain, and the places where organisational innovations, i.e. new, combined offers by OSS could be placed (Figure 17).

Figure 17. Mapping the building process, its actors and the innovation involved



Source: De Groote and Lefever (2016).

4 The European OSS map

In this chapter, we describe the 63 European⁴⁶ one-stop shops that have been identified in the scope of the current research. Every OSS was recorded as an individual one, even if the origin was the same, but then transferred to different countries, operated by independent entities, and adapted to the local contexts. For example the EnergieSprong-type OSSs that work in the Netherlands (the original) and the UK are considered to be separate OSSs. Similarly the CLEAR OSS in various countries (e.g. Italy, Belgium, Spain, etc.) were initiated in 2014 as part of a European project, however they continued to operate in the respective countries with locally tailored set-ups and goals. On the other hand, the project FinEERGo-Dom⁴⁷ is considered to be only one OSS for the time being even though there are planned pilots in 6 countries, because these are not yet launched and/or it is not clear what features they will have, and whether the operators will be unique.

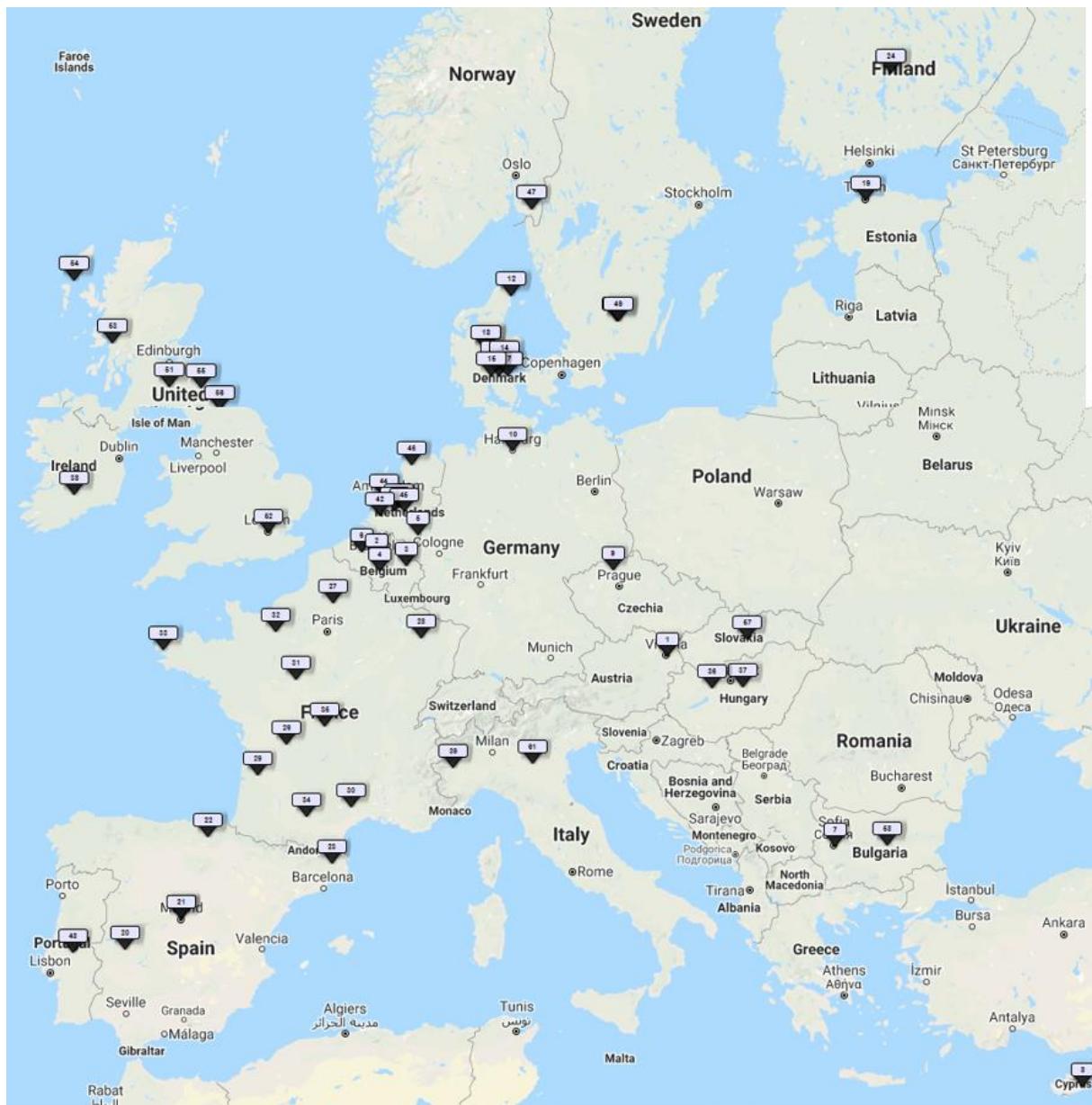
The data collection was carried out in three steps. A first collection of 23 OSS were presented in the preceding study in 2018 ([Boza-Kiss and Bertoldi 2018](#)), which was followed by a general call and search for more examples, including a Workshop in March 2019. Further OSS were identified with a snowball sampling exercise, whereas experts and the already known OSS were asked to point to other similar businesses. (See more on methodology in Annex I).

The 63 identified OSS are **located in 22 countries**. Besides those localized in the map below (Figure 18), three more MSs (Poland, Latvia and Romania) have projects planned with ranges of OSS-related projects (as FinEERGo-Dom project part of the). As shown in the map, around 2/3 of the EU Member States have at least 1 OSS on their renovation markets.

⁴⁶ When we analyze European OSS, we mean OSS in the EU Member States, Norway and the UK. In this research, one OSS was identified in Norway and six in the UK, which are included in the statistics shown.

⁴⁷ <https://fineergodom.eu/activities/projects/>

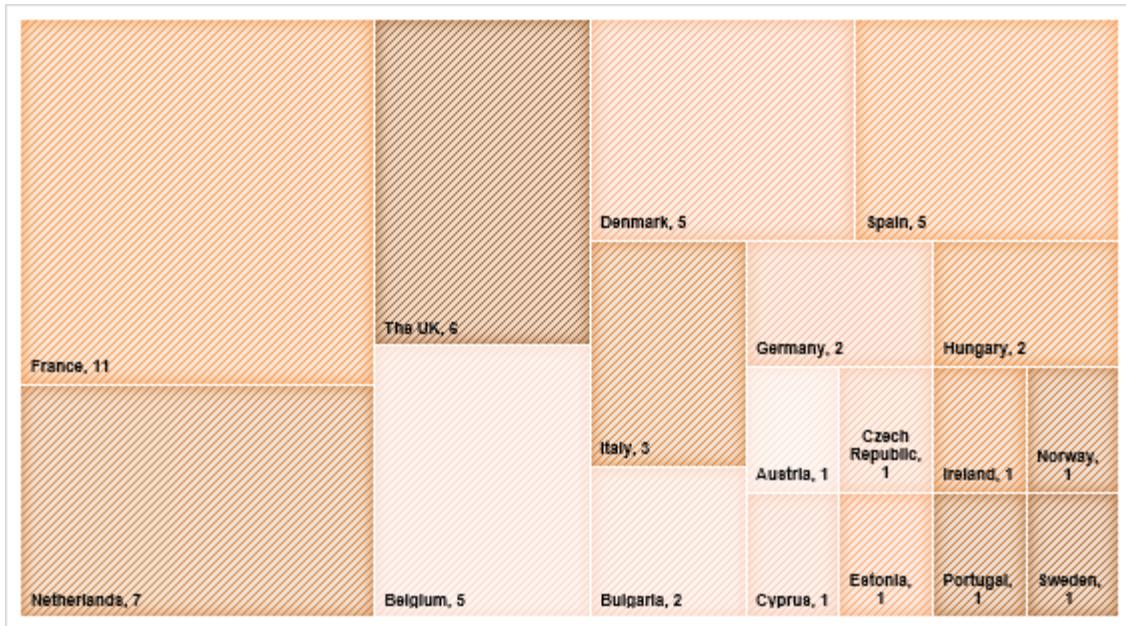
Figure 18. The location of one-stop shops identified in Europe.



Source: own compilation

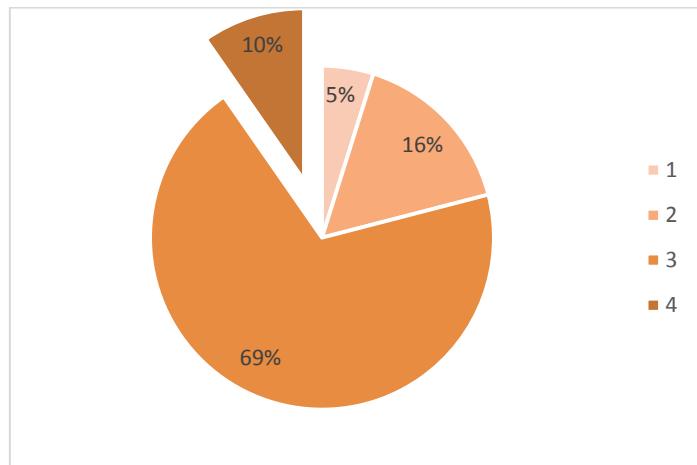
Of the identified 63 OSSs, **57 were found to be operating or planned to be launched soon across the EU, Norway and the UK, and 6 have been closed**. Regionally, Western Europe has most abundant OSS markets, centred in France, Netherlands, the UK, Belgium, Spain and Denmark (Figure 19).

Figure 19. The distribution of 56 working OSS across European Member States, Norway and the UK.



Note: The multicountry FinEERGo-Dom project is not included. Source: own compilation

Figure 20. Status of the 62 identified OSS in 2020.



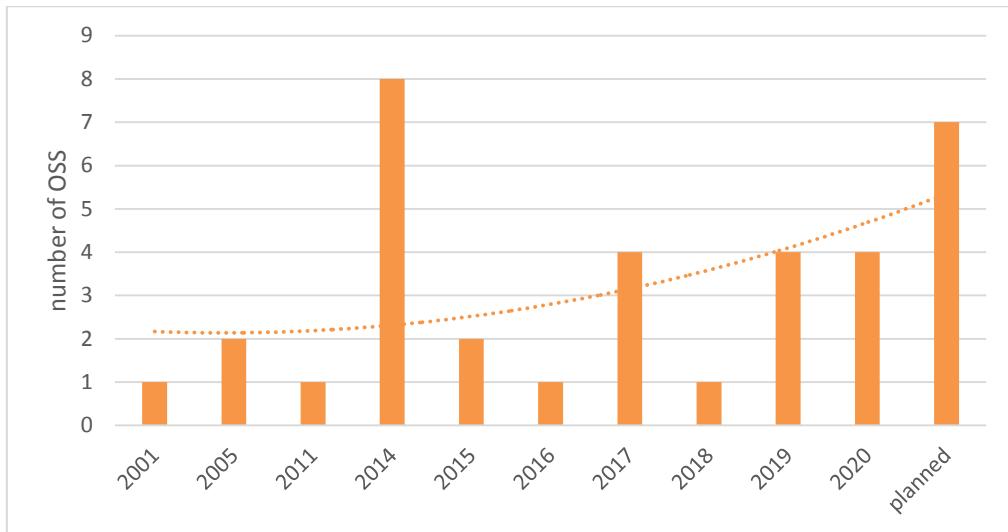
Source: own data.

Most of the identified OSSs are currently operational, only six have stopped operation, 3 are in pilot phase and 10 were planned to be launched soon (data as of beginning of 2020) (Figure 20).

One-stop shop services experienced a **boom in the last 5-10 years**. The launch date of about half (34) of the identified OSS were known. Of these, **only 4 started before 2012, and 24 were launched afterwards, with the most (eight) launched in 2014**. All of the OSS that stopped operations (six such companies) were started before 2010.

OSS have been largely started from the initiation by (local) administration or as a pilot in a Horizon Europe project (i.e. from EU research budget).

Figure 21. Year of launch where known (N=34).



Source: own data.

The observed OSS differed in **their servicing level of administrative regions**: 25 OSS serve at national level, 19 OSS work at a regional level (for example in the Basque country in Spain, Flanders in Belgium, the Western Islands in the UK), only 12 of the OSS were bounded to only one or a few cities, while 6 cases had a center in a city, but served the agglomeration and/or the surrounding region.

Most of the OSS are replication or transfer from other examples, like EnergieSprong.

4.1 Stakeholders in an OSS set-up

The set-up of the collaboration in a renovation project managed by an OSS is more complex than a regular refurbishment project at first sight. As demonstrated in Figure 12 (see earlier) **the renovation value chain is reorganised, whereas the OSS is placed among other actors in a construction/renovation project**. Value chain assessments are derived from Brown (2018), and based on interviews with SMEs in a Swedish study (Pardalis, Mainali et al. 2019) (see more about the study in Chapter 3.4). As seen there, the OSS acts as an organisational hub or an intermediary between the customer and the services. These renovation services can be carried out by the OSS itself, or by suppliers that are subcontracted by the OSS.

An OSS renovation supply chain consists of – at least: one or a bundle of customers, one or several contractors and the one-stop shop.

4.1.1 OSS - the intermediary

Naturally the one-stop shop is the key player in the OSS-based renovation value chain.

The configuration of the OSS has been found to belong to six main categories as summarized in Table 10. OSS. While all one-stop shops aim at building renovation and improving the energy performance of buildings by helping the building owners to go through the refurbishment process, the types listed have different operational structures and business models.

Table 10. The six key types of OSS identified (extended from Boza-Kiss and Bertoldi (2018)).

Government-driven (local or regional) OSS	Industry driven OSS	ESCO based OSS	Facilitator OSS	Cooperative type OSS	Store OSS
Their programmes are mostly driven by climate and/or energy considerations, sometimes by social targets.	Manufacturers or installers that aim to extend their businesses or improve customer care.	Building on their complex offerings, they extend and reclassify their value-added solution-parts.	Consultants that develop their original customer-related businesses, e.g. by extending the types of services, in order to reach more customers	Aims mostly at the societal benefits, not necessarily focused only at energy savings/cost savings	A large store or a warehouse, where the shoppers can get acquainted with the technologies and products, and have a personal contact option to ask for tailored advice and further assistance at the spot.
e.g. Ile-de-France Energies, SPEE Picardie, RenoBooster, HomeGrade	e.g. Reimarkt, CleanTech, ProjektLavenergi, BetterHome	e.g. Ile-de-France Energies, HolaDomus, EBRD credit lines	e.g. CLEAR, Tighean Innse Gall	Haarlemse Huizenwinkel, Retrofit Works	e.g. Center for Sustainability and WoonWijzerWinkel Rotterdam

Source: based on Boza-Kiss and Bertoldi (2018) and own data

As Table 10 shows, **some OSS can belong to more than one group**. For example, Ile-de-France Energies (earlier POSIT'IF) is a public-private partnership, whereas on one hand it is owned and supported by the regional government, but it is largely based on a third-party – in this case an ESCO – funding mechanism. CLEAR was started as an EU funded project⁴⁸, but the organisations, typically agencies, facilitators and consultants that run the project continued the activities on their own. Even more, CLEAR had some cooperative aspects, too, because the participants join in order to procure products in an organized way.

Some OSS belong to more than one category because a) their structure or ownership has changed in the meanwhile (e.g. CLEAR – as described above), b) they work as a consortium (e.g. Huisdokter in Limburg is a consortium of construction professionals, local authority, and private persons), c) they provide various services (Ile-de-France Energies is a semi-public new venture created with 85% of capital held by the Regional Council and Local authorities and 15% of capital held by Private partner).

When considering the main functionality and main owner, 56 OSS could be identified (for 7 OSS it was not possible to determine): **22 of the identified OSS are government driven, 18 are run by consultants or other private small organisations, 9 of them are subsidiaries of industrial actors, and 2 of them work as shops that have an OSS section.**

In more specific terms, the OSS in our sample are:

- a producer or its subsidiary (e.g. BetterHome, CleanTech, or Reimarkt),
- an energy agency (TIG in the UK),
- a project manager (Projektdoktor in Hungary),
- a new venture partially owned by a local government or its specialised body (Ile-de-France Energies),
- a department of a local or regional government (e.g. HomeGrade)
- a central procurement agency (Rhodoshop),
- a cooperative (Retrofit Works),
- a specialized store (WoonWijzerWinkel Rotterdam).

4.1.2 Clients in the OSS value chain

On the demand side of the value chain, the customers are typically owners of residential buildings, typically built before 2000 or even 1990. **Almost 80% of the OSS for which we have information (20 out of 26), target single domestic buildings. Six of these OSS are solely targeting single houses. Seventeen**

⁴⁸ Enabling Consumers to Learn about, Engage with and Adopt Renewable energy technologies (IEE 13-588), and continues thought Clear 2.0 Project (H2020- 749402)

of 25 OSS renovate multi-apartment buildings, and therefore, their customers are the homeowner associations or their representatives. **Three OSS** in our sample work **specifically with property managers and condominium managers**, this way they succeed in renovation works in multiapartment buildings.

The social aspects are captured by a number of OSS where **four of the identified OSS work with social housing**, although **none of them deal with these exclusively** (see more in section 5.3 and 5.4). In social housing refurbishment, the OSS supply their offer to the owners of these buildings in collaboration with the tenants. It is typical that these offers are fast paced, industrialized in order to reduce disturbance, while not driven purely by the cost-benefit value of the renovation, and thus able to carry out deeper renovations.

It is rare, but existent that OSS target specifically public buildings (e.g. RenoWatt in Belgium, Project Development Assistance for Local Authorities in Piemonte in Italy). It is more common that the OSS that have a focus on residential clients can also work with mixed-used buildings, and as a spin-off also with public buildings (e.g. HomeGrade).

4.1.3 Contractors: craftsmen

Most of the OSS in our study do not implement the renovation works themselves, but **coordinate contractors** that visit the households and implement the measures. For example, BetterHome has a pool of 100s of craftsmen that realize the projects formerly agreed between the OSS and the client with the instructions from the OSS. The OSS provides the contractors with the harmonized tools (e.g. digital platform), a training and company profile. The OSS also supports the draftsmen with customer care, and therefore any communication, complaint or further work request are handled by the OSS.

The contractors can work with the OSS in the following ways:

- subcontracted by the OSS (being a public organisation, a local-government subsidiary or an industry-driven organisation) to provide the services agreed with the client;
- a joint venture is set-up with the retailers (materials and product manufacturers / suppliers), so that the contractors become part of the one-stop-shop as a joint consortium. This joint venture helps the industrial partner to provide complementary products or services to their normal products.

Part of the construction industry these days has moved away from the conventional competition and contract models towards working in partnerships. These partnership have a potential to overcome traditional price-driven competition towards a more collaborative working environment and a value-driven competition. Moreover, each large building retrofitting project needs slightly different business models according to building ownership, building typology, scope of the retrofitting, requirements, barriers such as available financing, actors engaged, guarantees, referenced projects, etc. The actors in the retrofitting project life cycle should be able to choose the optimal business model, and should be able to realise it (organisation, contracts, resources, knowledge, and technical competences). Solid and well-defined methodology and digital tools are needed for the project based on development and implementation of these novel business models. An individual SME is limited in many ways to reach these goals. The best solution is a collaborative, cluster or networked based approach (Stunning n.d.).

4.1.4 Financial providers

The forth usual player in the OSS value chain are the financial providers. These are often banks: international or local. For example, BetterHome has direct partnerships with local banks, which refer clients between each other and the banks accept the renovation plans as the basis for the loans.

Financial solutions may be provided by ESCOs or other third-party as in the case of SEM Ile-de-France Energie or Picardie Pass. The local administration or a national fund may also be part of the financial partnership through a grant, tax reduction, etc.

The financial solutions are reviewed in section 4.6.

4.2 Value proposition examples

The services at different steps of the value chain shown in Figure 14 are explained below. These services are offered to the homeowners, i.e. the clients:

- **Assessment:** This is the first step in the direct support for clients, where the customer service journey starts and complements the approach of the energy audit, which provide individuals with

information about current inefficient losses and energy use, as well as recommendations on how to improve the energy performance of their homes and appliances. In particular, the OSS has the resources and knowledge to evaluate the current energy performance of the property in the hands of the client. The client has their own data, which they provide either personally to the energy experts or via an online tool.

The assessment is often carried out in two stages. Following a self-assessment using a web-based tool, or paper-based questionnaire, the client fills in the information and data about the status of the building and the energy related consumption. This is followed-by a tailored assessment, typically in a face-to-face meeting. The meeting happens with a specialized company (advisor) partnered with the OSS or with the in-house expert of the OSS. The place of the meeting can be the OSS office or the building in question. The role of the various stakeholder groups is summarized in Table 11.

A special case is when the OSS services are provided by a large warehouse, e.g. in the case of WoonWijzerWinkel Parkstad or WoonWijzerWinkel Rotterdam, both in the Netherlands.

Table 11. Role of the key stakeholder groups in the assessment. While two variations are indicated in the table, these serve as examples, and there can be several others.

	OSS	Client	Contractor(s)	Financier(s)	administration (e.g. local government)*	Examples
Alternative 1	Operates local office with energy experts	Visits office, collects data	Not involved	Not involved	Not involved	Reimarkt (6 offices around the Netherlands)
Alternative 2	Operates an online tool to aid self-assessment	Fills-in data, prepares for next assessment stage	Not involved	Not involved	Not involved	Espace-Info Energie, RenoBooster Hub Vienna

* Here in a function as administration, even if they operate the OSS. Their OSS role is already indicated in the first column

Source: own data

- **Guidance:** This is a direct follow-up of the previous step. The advisor (independent or in-house OSS) evaluates the data on the current status, compares to a set of interventions, and identifies the possible points of action.

There are OSS that work with a selected list of limited types interventions (for example the OSS-Ex of Extremadura in Spain will offer four very distinct intervention options: Window renovation, improvement of the building envelope, improvement of the HVAC system, and integration of Renewable Energy Facilities in the building), or tailored packages (such as the three packages of BetterHome that focus on different customer interest: energy optimisation, improved indoor climate or modernisation), or that explore every situation one-by-one (WoonWijzerWinkel Parkstad) (see Table 12). These interventions – while focused on energy demand reduction – must also consider comfort, structural and other renovation conditions, and thus should not simply be based on a cost-benefit analysis.

The result of this step is an energy renovation plan that takes into account the technical and financial feasibility, funding options, materials, available contractors, and realistic savings targets. The process itself from the desire to renovate to an accepted plan is highly dependent on the type of housing: simpler and more tailored for single households, while involving a range of decision steps in case of condominiums, making the latter more resource intensive from the side of the OSS.

Table 12. Role of the key stakeholder groups in the guidance. While two variations are indicated in the table, these serve as examples, and there can be several others.

	OSS	Client	Contractor(s)	Financier(s)	Administration (e.g. local government)*	Examples
Alternative 1	Individual renovation plan	Collaborates with OSS on selecting from alternatives	Provides offer through the OSS	Provides offer through the OSS or directly to the customer in partnership with the OSS	Provides financial support	Most of the OSS in this report, e.g. Frederikshavn, Aradippou, Litoměřice, etc.
Alternative 2	Renovation plan for condominiums	Establishes (if not yet existing) a representative body to manage the project; collaborates with OSS on selecting from alternatives	Provides offer through the OSS	Provides offer through the OSS or directly to the customer in partnership with the OSS	Provides financial support and potentially a larger scale renovation policy	Very few OSS are focused on condominiums, e.g. Ile-de-France Energies, Facilitateur Bâtiment

* Here in a function as administration, even if they operate the OSS. Their OSS role is already indicated in the first column

Source: own data

- **Access to finance:** The OSS either participates in the financing of the project directly, or – more often – as an intermediary. The OSS explores the funding sources that are already available and refer them to the clients. However, in many cases, when the existing schemes are not suitable, e.g. because local banks offer only short-term loans, or loans with high interest, or the clients have low creditability, the OSS can facilitate the setting up of new sources.

OSS assists the client to identify the best mixture of financing from available schemes (market-based financial products and public support, such as subsidies, tax credits and loans). As part of the project preparation the OSS should assist the homeowner to prepare all of the required paperwork.

Loans can be offered by partner banks (potentially supported by a public guarantee fund), or via revolving funds established by regional or national authorities for the purpose of supporting energy renovation of buildings.

Table 13. Role of the key stakeholder groups in the financing. While two variations are indicated in the table, these serve as examples, and there can be several others.

	OSS	client	Contractor(s)	Financier(s)	Administration (e.g. local government)*	Examples
Alternative 1	Direct financing	Evaluate own financial capacities and the need for further financial resources. Diligent repayment.	Timely completion of the project on a high standard to form the basis of the investment.	No role, as the OSS serves as financier.	In certain schemes co-finance, or support the OSS in the financial provision for the projects.	Oktave, which acts as third-party
Alternative 2	Mediating access to financing	Provide data to assess financial capacities and the creditability. Diligent repayment.	Timely completion of the project on a high standard to form the basis of the investment.	Collaborate with the OSS on evaluating the project for financing (this may involve training). Train the OSS to assist the client to prepare paperwork based on the technical specifications and financing needs. Work in partnership with the OSS.	Provide financial resources and funding schemes, ranging from grants, preferential loans to tax rebates and guarantee funds.	Bridging loans for Oktave clients – these are provided by local banks to overcome liquidity until the subsidy kicks in.

* Here in a function as administration, even if they operate the OSS. Their OSS role is already indicated in the first column

Source: own data

- **Implementation of the renovation works:** In order to simplify the renovation process, the OSS takes over the overall management and organisation of the renovation (Table 14). The OSS identifies and contracts the contractors, organises timing and material supplies. The OSS usually has a list of contractors that they work with, which is the basis of a standard level of services. A few OSS have capacities to carry out the implementation themselves. On the other end of the scale, some OSS do not actually hold all the contracts in their hands, but rather mediate between the contractors and the clients, in which case the client still needs to navigate with a bunch of contractors. The benefit of the OSS in this case is the assistance in the selection, the quality assurance and client representation.

Table 14. Role of the key stakeholder groups in implementation. While two variations are indicated in the table, these serve as examples, and there can be several others.

	OSS	Client	Contractor(s)	Financier(s)	Administration (e.g. local government)*	Examples
Alternative 1	In-house implementation (full management)	Contract the single entity OSS	Subcontract the OSS for some works, but most of the expertise is available in the OSS.	Provide financing solution for the technical implementation	No involvement	EnergieSprong
Alternative 2	Contractor mediation	Based on the recommendation s of the OSS, contract the contractors.	Carry out the works in a timely manner. The OSS may supervise the activities.	Provide financing solution for the technical implementation	No involvement	BetterHome

* Here in a function as administration, even if they operate the OSS. Their OSS role is already indicated in the first column

Source: own data

- **Quality assurance:** In order to ensure a successful and timely completion of the renovation projects, the OSS needs to guarantee that the contractors for the actual works are qualified, reliable and available. For this reason, the OSS often establishes a list of contractors to work with (Table 15). The contractors have to demonstrate that they have the skills, the technical and financial capacities to carry out certain sub-tasks.

Trainings are a popular way to set up a standard level of quality of the overall renovation, integration of parts of the process, develop specific knowledge on new energy efficient technologies and building methods, build a high level customer treatment, and establish uniform branding. OSS can provide the training themselves, or co-operate with training centres and construction associations to train contractors and installers. The trainings may be a way to achieve deep retrofitting. In addition, training programmes are also offered to banks and financial institutions to increase their awareness of the market potentials from energy renovation and specifically from the OSS-recommended projects.

Besides improving skills through trainings, some OSS use an online assistance tool to aid contractors at the renovation site and in dealing with the clients and their data.

Furthermore, the OSS establishes quality control procedures for the construction, and coordinates suppliers and contractors and oversees the whole renovation process. To this end, there is a process of meetings, site supervision, and evaluation of performance.

Table 15. Role of the key stakeholder groups in quality assurance. While two variations are indicated in the table, these serve as examples, and there can be several others.

	OSS	Client	Contractor(s)	Financier(s)	Administration (e.g. local government)*	Examples
Alternative 1	Training and/or online tool provision	No involvement	In order to become part of the system, complete the training and/or use the tool	No involvement	In some cases provide support (e.g. certification or financing)	About half of the OSS has this service, but Allenergy's Affordable Warmth Service and BetterHome specifically focus on this.
Alternative 2	Certification	No involvement	In order to become part of the system, complete certification	No involvement	In some cases provide support (e.g. certification or financing)	EnerPHit certification

* Here in a function as administration, even if they operate the OSS. Their OSS role is already indicated in the first column

Source: own data

- **Monitoring and follow-up:** After completion of the renovation, some OSS continue to stay engaged with the client, and monitor the results for up to several years. Notably, this is an integral part of the services, when the renovation is carried out by an ESCO, or when in-house financing is involved. In all financial set-ups, follow-up can demonstrate the benefits of working with an OSS, and measure client satisfaction, while providing basis for future marketing. Monitoring can be implemented through the installation of smart meters, follow-up energy audits, reports on energy bills and satisfaction surveys. OSS should also have the capacity for maintenance, where issues arise from materials and technologies installed (Table 16). The OSS or the ESCO can offer an energy savings guarantee when the home renovation is carried out under an EnPC or ESA contract (Bertoldi et al., 2020), this can facilitate the financing of the renovation, but it would add a cost for a more detailed M&V plan and for the ESCO or the OSS taking over the risk. This additional cost is often paid by the end-user. This would also need a longer contract, often over 10 years, as the payback period tends to be long for deep renovations.

Table 16. Role of the key stakeholder groups in monitoring. While two variations are indicated in the table, these serve as examples, and there can be several others.

	OSS	Client	Contractor(s)	Financier(s)	Administration (e.g. local government)*	Examples
Alternative 1	Performance contract	Share the cost savings under the EnPC contract	Collaborate in case of quality concerns	Repayment linked to the energy cost savings	Not involved, but may collect best practices	Oktave
Alternative 2	Monitoring for client satisfaction	Cooperate with OSS on monitoring on the site	Collaborate in case of quality concerns	Not involved	Not involved, but may collect best practices	HolaDomus

* Here in a function as administration, even if they operate the OSS. Their OSS role is already indicated in the first column

Source: own data

- **Horizontal activities:** Though not directly linked to their daily activities, some OSS take on the tasks of general awareness raising and information dissemination. Campaigns can focus on both the cost and CO₂ savings that can be achieved by building renovation, in order to raise interest in energy efficient renovations, and especially to improve commitment to even deep renovations.

Homeowners can learn about the specific value of interventions, and they may be convinced to complement improvements to the indoor environment, layout, functionality and comfort with energy performance improvements. Long-term attitude change requires frequent contact with new information, and should be interactive and engaging, making use of different media.

There are truly varied activities in which OSS provide general information. BetterHome and Reimarkt give an overview of the benefits of energy efficient renovation on their website. Reimarkt travels around the country to showcase general knowledge and specific solutions in industry fairs, pop-up stores and joining other events.

Information is available on most of the websites of OSS. However, a devoted information dissemination requires a lot of resources, which may be disseminated in a blog (Reimarkt), in news linked to its own projects (e.g. EnergieSprong in various countries, e.g. the Netherlands, the UK, Germany, France), downloadable documents or brochures (HomeGrade in Brussels, SIRE in Madrid). Many OSS provide information on previous projects, and a few give detailed data on the technologies and options available (e.g. the product site of Reimarkt, the main focus of CLEAR project operational in a number of countries, or the offline version of WoonWijzerWinkel Parkstad, which is practically a large store that tops up the sales with personalised consultations).

Table 17. Role of the key stakeholder groups in horizontal activities. While two variations are indicated in the table, these serve as examples, and there can be several others.

	OSS	Client	Contractor(s)	Financier(s)	Administration (e.g. local government)*	Examples
Alternative 1	Offline campaign – e.g. "store of measures" in a warehouse, pop-up stores; pop-up stores, industry fairs	Visit the warehouse, visit the event and meet the advisors	Be present in the warehouse with products, provide information to the OSS	Not involved	No information	WoonWijzerWinkel Parkstad
Alternative 2	Online information about general benefits of energy renovation and/or demonstration cases	Visit the website	Provide data and information to the website	Not involved	No information	Reimarkt, EnergieSprong, CLEAR, SIRE

* Here in a function as administration, even if they operate the OSS. Their OSS role is already indicated in the first column

Source: own data

Besides these direct services, OSS also offer collaboration or help to other market players. OSS facilitate the implementation of locally-developed project pipelines and strong and trustworthy partnerships with local actors (e.g. SMEs, financial institutions, energy agencies). **They also often develop partnerships with (local) banks.**

The integrated services can be provided by the OSS itself or through its partnerships. The offer of the OSS is always more comprehensive than those of the single traditional suppliers. When contracting an OSS, the client only deals with one or few contractors, which makes **the process more convenient, and ideally more trustful. The administration is simple due to a single entry point. Evaluation of the project is simpler, too, because the craftsman interact directly or via the OSS, instead of using the project owner as a mediator.**

The steps and the content of the offer can vary greatly, and different business models may add or miss some elements. It is important that the business models are adapted locally ([Brown 2018](#), [Mahapatra 2019](#)).

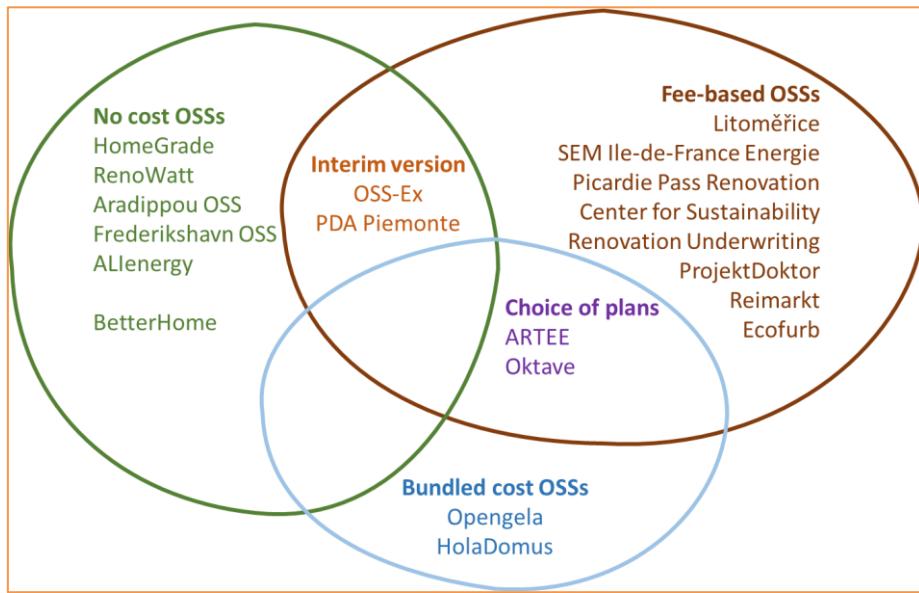
4.3 Price of the services

The one-stop shop offer includes more than a simple renovation project, and it is reasonable to expect that the service has a price tag. Of the 63 reviewed OSSs, we could collect information from 23 OSSs related to the prices that they work with. Three main business models have been differentiated:

- There are providers that offer **their services for free**, and the homeowners do not have to pay for the information and/or the organisational provision by the OSS. In total 6 out of 23 OSS have reported to follow this model.

- There are OSSs that are operated by a municipality **as a municipal service**. For example, HomeGrade in Brussels, RenoWatt in Wallonia (in case of private customers), Allenergy in the UK work with this model, and contribute to a wider community target, e.g. carbon-reduction target.
 - The service offered by BetterHome is also free because 4 industry partners established the OSS to provide **community service to potential customers**, who then often purchase their products.
 - Two of the 23 providers indicated that currently they offer their services **for free**, either because they are testing the service, or have other revenue sources specifically for offering the service. However, they consider running the OSS services with a price in the future. For example, the OSSs in Extremadura (Spain) is being set up and is currently financed under the EU projects INNOVATE and HousEEInvest, but future business model alternatives are being explored during this phase. Another example is the Piemonte OSS under the Project Development Assistance (PDA) scheme.
- Under another business model, the OSS sets **a fee for the specific service**, which typically includes general and tailored advice, feasibility study, selecting contractors, technical assistance during the project, and monitoring the technical implementation and savings. These value offers may not all be included, however, the price can be clearly matched with the content. In these cases, the implementation costs are clearly separated from the OSS service costs, and probably depends on the content of the renovation and the contractors chosen.
 - Prices can be set as **a fix price**, and range across large varieties depending on the country (and thus the customers' financial possibilities), and the cost structure of the OSS. Examples range from e.g. 4.000-2.500 EUR per transaction, to ca. 600 EUR per customer, down to 4 EUR per apartment in case of multi-apartment buildings.
 - A number of OSS **link their prices to the overall project volume**. For example the Center for Sustainability works with a small fix fee and 10% of the renovation costs. Reimarkt also asks around 10% of the full project cost.
 - Several of the OSS **offer various plans**, depending on the requirements of the customer. For example ARTEE in France offers a basic service of energy consumption assessments for a fix price (close to 500 EUR), which can be complemented by packages of varying commitment, from full support including third-party financing, contractor analysis, monitoring, eco-gestures training, etc. (for close to 2000 EUR per project), to light support with less content and for about half or less price. Oktave has a very similar plan, and other French models include traits of this model, too.
- There are OSS that **bundle their offer to another service** and consider the OSS service as free, while paying for other services. For example, OpenGela and HolaDomus will not charge the homeowners, but the contractor will pay a fee per project for basic services. However, the homeowner has the option to hire these OSS for additional services (typically, for 'project management'), whose costs are born by the customer.
- Finally, two of the interviewed OSSs reported to have no final decision about the final pricing of their services yet, because they are in the planning phase.

Figure 22.The three main business models identified in our survey



Source: OSS survey

4.4 Costs

The **costs of the operation of OSSs vary significantly** among the ones for which we could access these data, depending on a number of factors:

- the variety of services that they offer to their customers,
- the location,
- the level of development of the business plan and what services are included,
- the intensity and the type of the customer support (for example whether their services are online and/or offline, or the level of tailoring they offer, etc.)

The operating costs of an OSS business ranges from **120.000 EUR/year** in Eastern Europe to around **800.000 EUR/year** in the available Western European examples. These costs may vary greatly depending on the complexity of the service and coverage of the value chain. The larger OSS have to work much larger budgets.

Typical costs reported by the observed 23 OSSs are:



human resources, such as one or few architects or engineers, marketing specialists, an IT specialist, and a financial expert



office space, which ranged from traditional corporate offices, where the team works if the OSS is solely online to large info spots. There are a few exceptional cases in our OSS list:



IT tools for customer engagement



IT support to the craftsmen

The **return of revenue (ROR)** is not possible to define from the data collected. Only a few OSS provided data on the specific costs and total revenue per project, and averages cannot be concluded. However, information on a number of OSS that operate as social services indicate that simple OSS services (feasibility study or tailored advice only) cost around 100-550 EUR/project and typically all or up to 80% of this cost is covered by the OSS, light services (tailored advice, quotes section, monitoring, technical support) cost around 1000-2000 EUR/project, of which 50-70% is paid from the OSS budget, and the customer only pays less than 50% of all costs. In case of full service the total costs reach up to 3000-6000 EUR/project, and 50-70% are paid by the customers, while the remaining 30-50% are settled from subsidies.

4.5 The size of the OSS market

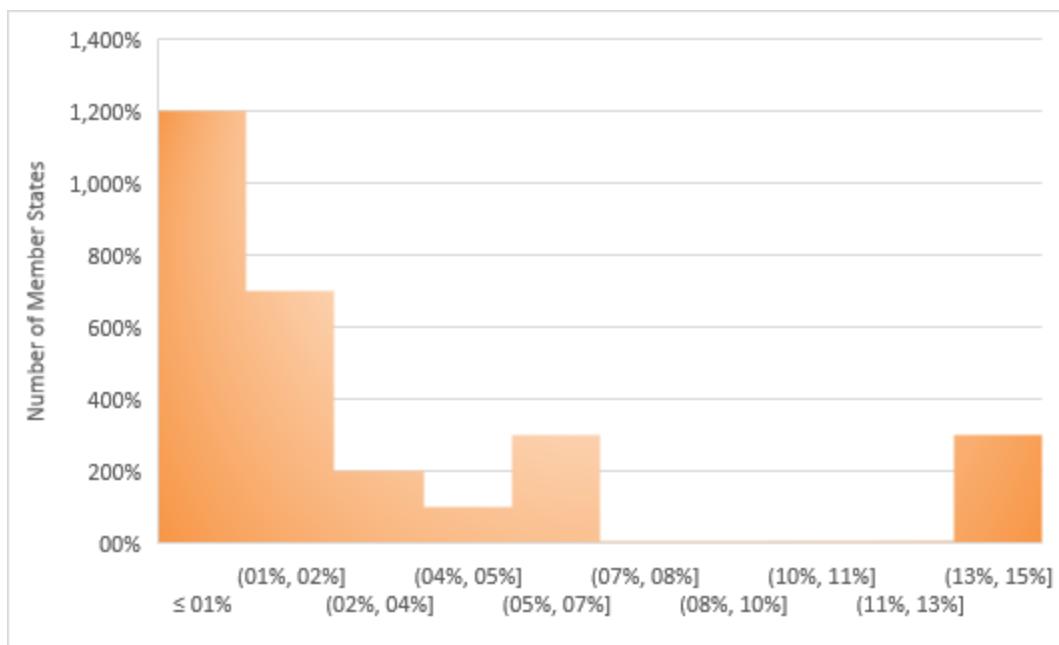
The OSSs on our radar reported to initiate between 100 and 550 household renovations per year during the years they were active. The OSSs that are in pilot phase currently aim at an average of 10-15 projects per year.

During the collection of case-studies, the increase in identifying OSS was on average 4-times from a first collection (Boza-Kiss and Bertoldi 2018) to the second phase, as shown in this report. Assuming that

- further identification efforts would lead to another quadrupling, but no kick-off in countries without any OSS as of now;
- 500 renovation or construction projects per year;

The ratio of OSS-projects in the total volume of new construction and renovation projects (as reported in the IDEES database ([Mantzos, Wiesenthal et al. 2017](#))) is over 10% in three Member States (Denmark, Cyprus and Estonia), around 5% in another three countries (the Netherlands, Belgium and Bulgaria), and between 2% and 5% in 10 Member States (Italy, UK, Sweden, Spain, the Czech Republic, Austria, France, Ireland, and Hungary) (see Figure 23). In certain cases (esp. Bulgaria, Cyprus, Estonia), the calculation is a clear overestimate due to the low volume of total renovations.

Figure 23. Potential share of OSS activity in total national construction and renovation rate.



Source: own data and IDEES database ([Mantzos, Wiesenthal et al. 2017](#))

4.6 Solutions that enhance an OSS service

The business case of one-stop shops for energy renovation of residential buildings has been described in the previous chapters. It is based on the offerings of technical, organisational and financial elements that make the complex energy renovation easier and swifter.

The OSS engage with a number of technical, organisational or financial innovative solutions that package effectively with the whole-supply chain idea. These include working with standard technical elements, such as prefabricated building parts, or hinging on a certain life-event or another renovation goal of the tenants and owners, and they use a number of innovative financial solutions, such as EnPC or PACE.

4.6.1 Combination with other refurbishment aims: Partnership with transaction companies for the right timing

Around 90% of the total building stock is in need of renovation in Europe (see Section 1.1.), buildings are obsolete and need either structural or aesthetic upgrades. Home-owners and tenants are most likely to renovate the homes and buildings during a transaction, such as purchase or rent. It is most common to upgrade the kitchen and the bathroom, but often the façade is also renovated. These renovations largely cover structural and/or aesthetic changes. However, an energy performance improvement can be more easily added at these points than as a separate element. For example the alternative (three main packages) of Reimarkt or packages offered by Refurb integrate comfort improvement and energy saving measures, making these more attractive and less economic-based decisions.

The transaction events are not easily captured by the traditional construction sector. Yet, several OSS have established collaborations with real estate agents, who can connect them to the newly contracted homeowners or new tenants that are in the right phase for renovations. The new tenants can be offered a special renovation package as part of the purchase or the rental agreement, or simply connected to refurbishment suppliers to improve their buildings at the start.

4.6.2 Packaging of interventions or step-by-step approach

As mentioned earlier, certain OSS (e.g. Reimarkt and BetterHome) recommend three basic packages that include a different set of renovation measures. A list of measures that can be grouped because of easy complementarity, price and timing is separated from the other list and the tenant can choose from them.

In another variation, “the Step-by-Step renovation” consists in the replacement of different building components (such as windows, plasterwork, roof covering, boiler etc.) closer to the end of their lifetime, thus encourages the building owners/tenants to implement only fewer but more economical measures at one time, and upgrade the works later in a next step. Some OSS (e.g. BetterHome) regularly contact their customers after the implementation has ended to inquire whether they were willing to continue with a follow-up work.

When applying this approach (e.g. EnerPHit), a building renovation plan should be made for all measures, including those which lie in the distant future, before starting the work. In this way, it can be ensured that an optimal end result is achieved in terms of cost-effectiveness, energy efficiency and quality.

4.6.3 Pre-fabricated technical elements

Prefabrication of buildings, building parts and renovation elements has around 100-year long history: development of concrete large panel systems started already before the Second World War and growth remained intensive in the post-war period. The use of pre-constructed elements and parts led to standardized quality and an increase in the effectiveness of the construction process ([Pihelo, Kalamees et al. 2017](#)). Recently, search for innovative ways to minimize construction/refurbishment costs and tenant disturbances at the same time lead to the reinvention of similar, but multifunctional prefabricated elements. Additional benefits include reduced operating costs and environmental impact of buildings, while also increasing functionality if these renovations lead to low energy buildings.

The project MORE-CONNECT⁴⁹ has shown that it is possible to achieve deep renovation towards NZEB with up to 80% energy savings compared to original consumption and within a very short time, including installation time of maximum 5 days ([Mørck 2017](#)). The project has demonstrated that construction site workload ratio can be reduced from the average of 50% to 10% only, while also reducing construction failure from the traditional 15-20% to less than 5%.

The Energiesprong retrofit scheme applied by a number of OSSs across Europe (and in the US) results in net zero energy renovations. Around 5000 households were refurbished in the Netherlands by Stroomversnelling (originally Energiesprong). The renovated houses generate the total amount of energy required for their heating, hot water and electrical appliances, and provide significantly improved indoor comfort. This can be achieved by using new technologies, such as prefabricated facades, insulated rooftops with solar panels, smart heating, and ventilation and cooling installations.

4.6.4 Pooling of buildings

In order to achieve economies of scale, OSS sometimes bundle several renovation projects together. This can reduce the prices of materials and works, as well as the costs of financing, if needed. This approach is mostly beneficial for relatively small scale interventions, not deep renovation ([Interreg Europe 2019](#)).

Alternatively, standardized measures can be applied to a series of very similar buildings, as it is done by EnergieSprong. The multi-disciplinary team of complementary actors is set-up, consisting of partners with complementary competences, such as architects and designers, constructors, energy-efficiency experts, market and financial experts, technology suppliers, strategy and operations planners. Starting from the initial design phase, the team works together, in strict collaboration with the building owner, in order to select the optimal renovation measures to adopt, planning the whole renovation project according to customers' needs. The cross-fertilisation of gathering different actors together in an early phase of the renovation project permits to define a holistic approach to the renovation intervention. In this way sustainable and energy-efficient retrofitting solutions can be deployed, with an optimal control over the total costs of the renovation project and guaranteed efficiency performances.

4.6.5 Digitalisation

Many of the OSS use digital tools at various stages of their value chain. Reimarkt and BetterHome expect the interested home-owners to go through an online pre-project phase in the initial planning of the renovation work. The online tool helps the home-owners identify their own aims, the level of intervention they can afford, and the tool guides them to optimize the choices. The ICT tool processes the information gathered and suggests an optimised approach to the renovation project.

The contractors (actual implementers of the measures, see chapter 4.1.3) also use digital tools to assess, record and track, and finally monitor the measures to be done. The main advantage of digital tools is the possibility to harmonize the renovation works and effectively manage the whole process. The quality of the initial information is highly important. In addition, a solid understanding of users' behaviour and willingness to commit to energy savings is essential. The online/digital tool supports the designer/contractor to map the main project objectives and to suggest an optimized plan of renovation. This key player needs to be adequately trained and be devoted to the OSS in order to harmonize the project.

The digital tools can also help increase awareness and knowledge of interested, but not yet committed building owners.

Furthermore, digitally supported OSS renovation has a smooth linkage with financial services. The banks or other financial providers that can better access the information, will have the approval of the project and calculations directly from the OSS or the contractor, which can serve as a guarantee for the project success and help the granting process easier and more reliable from both the bank and the client perspective.

⁴⁹ <https://www.more-connect.eu/one-stop-shop-concept/>

4.6.6 Financial instruments

One-stop shops integrate some level of financial evaluation and solution into their offer. As described in chapter 4.1.4, OSS provide financing directly integrated into their value offer or mediate the access to various financing options. In the latter case, the existence and partnership with alternative financial schemes is critical for the smooth implementation of a project. The following list of typical schemes that combine well with the technical solutions of the OSS is fully based on the report by Interreg Europe ([2019](#)).

Energy Performance Contracting (EnPC) – This model is particularly prevalent in OSS services that started off as Energy Savings Companies (ESCOs). It enables the homeowner to cover the costs of the renovation services via the energy cost savings. These repayments can be either shared savings, in which the contractor takes a percentage of the savings over a period of time, first out, in which the contractor recoups all savings until they are paid off, or guaranteed savings, whereby the beneficiary covers the upfront costs, but the ESCO must meet a minimum performance level, and may have to pay the difference if performance falls short. Example: EPC forms a key feature of the OSS offer of Ile-de-France Energies (formerly Energies Posit'if).

Referred bank loans – The OSS, partnering with a bank, may issue advice on the most suitable financial product for its needs, and help them to complete application forms. The regional or local authority may not use any of its own funds in the actual set-up of the financial products offered by the institutions (unlike the approach below), but instead involve some training for, and active engagement with, local financial institutions. Example: BetterHome has established partnerships with local banks, and mutually trained each other to facilitate the financing of the clients' renovation projects.

Financial instruments & investment funds – There are a number of municipal-based OSS that established their own revolving funds and created financial instruments to offer loans to households at favourable rates. These can be established using public funds, direct borrowing through General Obligation Bonds, or using European Structural and Investment Funds (ESIFs). European funding can be used to create guarantee funds for local banks to encourage them to invest. Example: The OSSs in France.

Property Assessed Clean Energy (PACE) – A local government issues bonds for renovation projects, with the homeowner repaying via increases in the property tax bill. The scheme originates from the United States, and have been under testing by the EuroPACE project⁵⁰.

4.6.7 Energy Efficiency Certificates

Tools that inform home owners, raise their awareness or otherwise motivate them to engage in a refurbishment, in particular in an energy renovation form a crucial part of an OSS-driven refurbishment (see Figure 8). OSS have no capacity to topple awareness or opinion, and their offers are typically taken-up by already informed citizens and organisations. Therefore, Energy Performance Certificates or other labels, audits, evaluation, smart meters expand the population size that can be targeted by OSS ([Refabert 2019](#)).

⁵⁰ <https://www.europace2020.eu/>

5 Policies for one-stop shops

One-stop shops have been found to operate in 22 Member States, but only few have specific policies directly relevant for them. Nevertheless, a large selection of policies still interact positively with the OSS concept and either prepare the ground, push or pull renovation works that are carried out within the OSS solution. In the process of interviewing and surveying, the authors of this report were able to collect information on policies and their interaction with OSS in 19 of the 63 cases, which are reviewed below.

5.1 Policy support examples

EU level:

There are a number of EU policies and programmes that are supportive of energy renovations through one-stop shop models. For example, the OSS has become a critical element of the “**Smart financing for smart buildings**” initiative⁵¹, where

Member States are encouraged “to develop dedicated local or regional one-stop shops for project developers, covering the whole customer journey from information, technical assistance, structuring and provision of financial support, to the monitoring of savings. These facilities should lead to more locally-developed project pipelines and strong and trustworthy partnerships with local actors (e.g. SMEs, financial institutions, and energy agencies), the key being to connect the supply of finance with demand for it. The development and replication of these one-stop shops will be supported at the EU level by an exchange of good practices through Manag'Energy, funding through Horizon 2020, the EU Project Development Assistance facilities, or funding from the European Structural and Investment Funds (ESIF) when relevant.”

One-stop shops are also advocated by the **Directive 2018/844/EU**, which amends the **Directive 2010/31/EU** on the energy performance of buildings (EPBD) and **Directive 2012/27/EU** on energy efficiency (EED).

Recently, the OSS potential to support energy renovations has been explicitly mentioned in the **Renovation Wave initiative**⁵². As a result,

“the Commission and the EIB will support setting up standardised one-stop shops that can be deployed quickly at national, regional or local levels for delivering tailored advice and financing solutions designed to accompany homeowners or SMEs throughout the preparation and implementation of their projects”.

The EU has mostly supported OSS-based renovation through **research and innovation projects**, which enabled funding, awareness raising, training, organisational set-up, and experience sharing. For example, the project INNOVATE, the CLEAR project, ReFurb, EnergieSprong and its partner projects, such as Transition Zero, etc. These have been critical in the development of the OSS concept in the Netherlands, Belgium, France, then in the UK, Spain, Italy, and lately in Slovakia, Cyprus, Austria and Hungary. **In the Nordic regions, e.g. certain OSS in Denmark and Sweden reported that there are no policies** in these countries that support their businesses. Nevertheless, research and innovation grants have been available at EU level also in these countries, and local-government based OSS concept has been transferred to Denmark e.g. in Frederikshavn.

European Investment Bank (EIB) and other EU or supranational pipelines, including ELENA have been used for financing OSS, e.g. ARTEE in France, Limburg in Belgium, RenoWatt, etc.. PDA has supported the SEM Ile-de-France Energie (formerly Energies POSIT'IF) and Oktave in France and Project Development Assistance for Local Authorities in Piedmont in Italy.

National level:

The countries where the **energy efficiency policy framework is strong** enough or is developing, OSS have an easier way to operate. This situation has been described in the case of some Spanish OSS, and in France (e.g. the law No. 2015-992 of 17th August 2015 on Energy Transition). **National commitments and targets**, such as the Near Zero Energy Building (NZEB) retrofit commitment in 2015 that resulted the Superhomes project are found to be the kick-starters of many OSS. The climate law in Spain (la Ley General

⁵¹ Accelerating clean energy in buildings. Annex to the Clean Energy For All Europeans. Brussels, 30.11.2016. COM(2016) 860 final.

⁵² https://ec.europa.eu/energy/sites/ener/files/eu_renovation_wave_strategy.pdf

de Cambio Climático) targeted at carbon neutrality by 2050 has played an important role in catalysing interest in sustainable home renovation.

National subsidies are available for building renovation that OSS can use for the implementation, e.g. in France most OSS link their services with national (and other) grants, such as SPIRE. ProjektDoktor in Hungary also helps building owners and tenants to access national funds to finance the renovation works, as part of their services. In Ireland, large rate (over 30%) of support is available for heat pumps, which has been a driving force for the Superhomes project.

Along these lines, energy-saving initiatives, or other **energy efficiency obligation schemes** can be linked to OSS renovations, too. For example, BedreBolig in Denmark receives funding from energy savings. The homeowner sells the quota on energy saving to the distribution company and receives a subsidy in return.

Regional level:

Energy efficiency policy framework can be properly defined to support home renovations, e.g. in the case of Hauts-de-France regional policies that support Picardie Pass Rénovation.

At regional level **removing barriers to the ESCO model and Energy Performance Contracting** has helped to overcome financial obstacles to renovation investments, e.g. in Flanders the regional government considers all investment realized with an EPC model as “productive investment” and has helped RenoWatt to function.

The **regional policy** in the Basque country and Catalonia on housing enforces “public-private partnership” for home retrofitting efforts, and thereby set the ground for the establishment of OpenGela and HolaDomus. Part of this policy is a Social Guarantee Fund to support renovation by vulnerable population (see more in section 5.4.).

Local level:

Most important policy at local level is the setting up and operating the municipal-base OSS itself.

As discussed in section 4.1.1, around 40% of all OSS are run by local governments as a department or as a subsidiary body. These OSS are closely linked to the building renovation programmes of the cities. For example, RenoBooster in Vienna or HomeGrade in Brussels, or Bordeaux Métropole Energies (BME) and Espace-Info Energie in France, etc.

Climate or energy targets provide a working framework and willingness to help by the local governments, and awareness by building owners. Recently, cities have also targeted **renovation minima**, for example, the city pledge in Toulouse that aims to renovate 7500 projects per year by 2025, increasing from the current rate of ca. 3000 renovations/year⁵³. In other places, the smart city ambitions can boost interest in digitally attractive OSS services, e.g. in the case of Reimarkt in the Netherlands. The municipality of Olot has passed a local ordinance declaring its support for the EuroPACE mechanism, which meets a valid public purpose, and thus supports HolaDomus in Catalonia. Heerlen in the Netherlands, has made massive efforts to revitalize the region through innovative and sustainable energy policies after the economic challenges due to ending the mining activity, and has committed in its new Sustainable Energy and Climate Action Plan to become a carbon neutral city by 2040. Furthermore, in the Netherlands local governments are obliged to adopt policies to move away from fossil fuels for heating, and these policies have induced a wave of refurbishment projects by home owners and social housing companies. The local OSS are able to surf on these local pledges and interest in building renovation by the local owners and tenants.

If not directly running them, cities often participate in OSS financing through **local grants or tax reliefs**, such as the local subsidies to support the BedreBolig-Plan. In a survey about BedreBolig, 66% of clients claimed that they would not have done the renovation without the financial support of the city.

Other OSS enjoy the support of the local administration through **information sharing and promotion** (e.g. in Slovakia). The New Energy Overijssel program⁵⁴ runs between 2017- 2023 to facilitate the energy transition in Overijssel by connecting partners and relevant programs.

⁵³ <https://www.infoenergie-toulousemetropole.fr/actualites>

⁵⁴ <https://www.nieuweenergieoverijssel.nl/nieuwe-energie/>

5.2 Policy barriers examples

EU level:

The **lack of comprehensive obligation to renovate buildings** is a key hindrance to the OSS implementation, because this limits the extent of total building renovation. The low rate of yearly refurbishment (below 1% per year as shown in section 1.1) should be increased, and OSS could be one way towards this target.

The **Eurostat rules on EPC accounting** in national books is still causing a barrier to larger uptake of EPC financing, which would be one key element of the OSS solution in Belgium. Even though the Eurostat rules have been revised and explained several times ([Bertoldi, Economidou et al. 2020](#)), it remains an issue in a number of Member States.

National and regional levels:

The lack of a **durable and stable policy** from the national and local government creates uncertainty with home owner

Supporting building renovation through **grants is a very costly policy**, and has only limited potential. The OSS that depend on national subsidies are limited by the rate and the size of funding.

Pooling and aggregation of buildings for an OSS project need **very stable legal and financial framework**. When these lack, for example reported in Italy, then the OSS market will halt and projects cannot be developed.

The **loan** used for the renovation is **linked to the home-owner** as a personal bank product. If a home owners sells his or her house the loan cannot be transferred to the new owner. While there are efforts to resolve this barrier, it is a critical financial concern in many countries, e.g. in the Netherlands.

Local level:

The limitation in **giving out grants** is the same as at national level. It is a **very costly policy**, and has only limited potential. The OSS that depend on national subsidies are limited by the rate and the size of funding.

In some countries, the **energy markets remain rather unclear**, which results in the distancing between supply & demand.

When there is no energy regulation for the renovation of detached houses, the OSS can tackle much fewer projects because of lack of interest.

Many subsidy schemes promote single measure investments, such as window renovations or heating system. There exist tax incentives for all kind of renovation but not specific for the energy renovation. Energy advises are available but adviser are not allowed to make home visits for the comprehensive and tailor made solutions. Energy audit reports are required while selling or renting the houses, however their quality is inadequate.

Table 18. Supportive and hindering policies for OSS project implementation at EU, national, regional and local levels.

		Supportive policies	Hindering policies and barriers
Level			
	EU level	<ul style="list-style-type: none"> ⌚ Horizon Europe projects for research and innovation ⌚ EIB funds, ELENA, PDA ⌚ Climate and energy targets 	<ul style="list-style-type: none"> ⌚ Lack of jurisdiction over buildings and renovation. ⌚ Lack of pledges on renovation rate. ⌚ Eurostat rules on EPC accounting
	National level	<ul style="list-style-type: none"> ⌚ Energy efficiency policy framework ⌚ National commitments and targets ⌚ National subsidies, tax reliefs ⌚ EEOs 	<ul style="list-style-type: none"> ⌚ Lack of energy regulation for individual houses. ⌚ Costly grants and thus quickly drying out funds. ⌚ Improper promotion (if any) for building renovation. ⌚ Loans are personally-linked instead of building-based.
	Regional level	<ul style="list-style-type: none"> ⌚ Regional energy efficiency policy framework ⌚ Removing barriers to ESCO/EPC 	<ul style="list-style-type: none"> ⌚ Costly grants and thus quickly drying out funds. ⌚ Lack of renovation policies. ⌚ Lack of motivated government to lead by example in energy renovations.
	Local level	<ul style="list-style-type: none"> ⌚ Supporting the OSS solution through information sharing and promotion ⌚ Establishing the OSS as part of the municipal services ⌚ Climate or energy targets ⌚ Renovation rate targets ⌚ Local grants or tax reliefs 	<ul style="list-style-type: none"> ⌚ Costly grants and thus quickly drying out funds. ⌚ Lack of coordination of national promotion campaign and locally available suppliers. ⌚ Opaque market situation, no connection between supply & demand.

Source: own data

While the policies are numerous that can support the start-up or the operation of OSS, **equally, one-stop shops can be a critical element in a wide-scale renovation directed at energy performance improvement, if its potential for replicability can be tapped upon.**

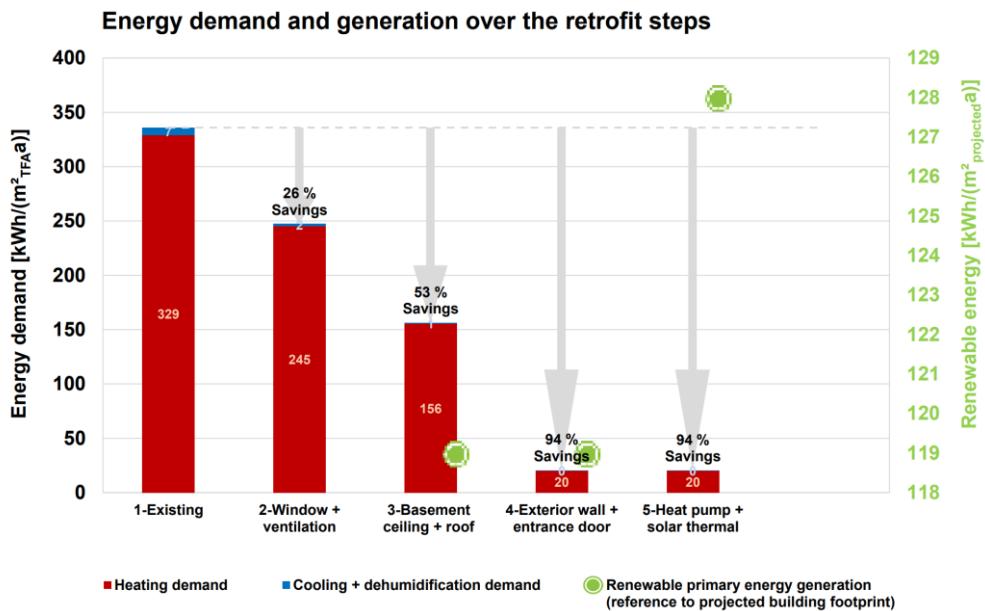
5.3 Role in deep renovation

The 2018 EPBD revision has highlighted the need for more policies and actions to stimulate cost-effective deep renovation of buildings, including staged deep renovations. These renovations are generally understood to capture the full cost-effective energy efficiency potential of a building, leading to a very high energy performance level ([GPBN, 2013](#)). Whilst a common definition for deep renovation is not yet available at EU level, deep renovations often entail major modernisation actions including insulation of the building envelope, upgrade of technical building systems and installation of renewable energy source systems and smart control systems.

Deep renovations may be designed and executed in a single step manner where all actions are performed at once. One-step deep renovations offer the advantages of integral planning, optimised costs and absence of lock-in effects⁵⁵. Staged or step-wise renovations, on the other hand, allow for less disruptive processes and spread the renovation costs over the time, thereby reducing upfront costs. Staged renovations form the most common type of renovation across Europe due to their alignment with various possible stages of a building's lifetime including routine repairs, emergency replacements, building extensions, ownership transfers, occupancy changes etc. ([Mahapatra \(2019\)](#), [Fritz et al \(2019\)](#)). As staged renovations may lead to locked-in energy savings and sub-optimal energy performance levels in the long run, it is crucial that they are well planned, designed, and executed in a thorough way. An example of such well-designed staged renovation is developed and tested by the EuroPHit step-by-step approach (Figure 24).

⁵⁵ In this context, lock-in effect describes a situation in which a recently renovated building is "locked" in a poor energy performance level due to insufficient, shallow renovation standard. The next renovation phase may occur in several years or decades after this "missed" window of opportunity, thereby missing out on important energy savings.

Figure 24. Illustration of an EnerPHit Retrofit Plan for an end-of-terrace house showing the heating demand and generation of renewable energy (right-hand axis) in the existing building and after the four steps.



Source: Bastian (2016)

The role of OSSs in stimulating one-step or staged deep renovations has not been investigated in detail so far. In theory, the traditional, business-oriented OSS model is more adequate for renovations with clear economic benefits, and these have had limited participation in **deep renovations**. Therefore, the role of active policy support is important, designed to contribute to large energy efficiency improvements.

Nevertheless, a few OSS have been found to promote deeper renovations. A key element that often determines whether deep renovations are supported by OSSs is their structure of governance. For example, French OSSs are often run and supported by local or regional government. This offers the opportunity to create a synergy between the ambition of the projects handled by OSSs and energy efficiency targets promoted by French policy. For example, Espace-Info Energie in Toulouse is an associative company whose goal is to accelerate energy transition through impartial counselling and follow-up of research, studies and other initiatives. As part of the training and educational activities, they run the “Positive energy families” challenge with the objective to mobilize participants to generate substantial energy savings at home. Another example is the Superhomes OSS run by the Tipperary Energy Agency and supported by the Sustainable Energy Agency Ireland. With recently announced scale-up plans, the Superhomes model promotes energy rating A renovations and constitutes one of the most interesting case studies covered in this study. The plan is to transform the Superhomes offer from a model, which completes 100/€6m worth of retrofits per year in 2019 to 3,000/€150m per annum by 2030. If successful, it will implement 10% of all retrofits in Ireland by 2030 and generate investments of €657m from 2020 to 2030. This ambition will be achieved through the development of:

- 4 Regional Superhome One Stop Shops which will engage 80 High Performance Contractors to deliver quality retrofits nationally
- capacity building and training for homeowners/surveyors/contractors/technical staff (>200 people trained)
- attractive finance solutions independent of public finances, financing >€67m per annum by 2030
- optimisation of technical analysis and design systems and solutions.
- creation of open source energy performance data platforms which demonstrate the value of undertaking nZEB retrofits to the market

Further Superhomes plans include the facilitation of a Deep Retrofit Community of Practice (CoP) to promote dialogue between experts, practitioners and agencies across Europe and promotion of technical solutions

using best practice standards. Opportunities to expand the Superhomes model outside of Ireland are also to be explored using linkages created through the European Heat Pump Association and FEDARENE. Beyond the Irish model, Energiesprong in Netherlands and France is another interesting OSS case study, as it actively supports net zero energy renovations. An overview of these OSSs explicitly or indirectly supporting deep renovations in Europe is presented below.

Through appropriate policy interventions, it is possible to develop a strong relationship between deep renovations and the OSS model. In the question as to what policies would be helpful in achieving deep renovation through the OSS model, questionnaire respondents identified several financial, regulatory and capacity building actions. These include national or regional compulsory renovation programmes, mandatory renovations for all public buildings, revision of Eurostat rules and favourable national and regional laws on energy efficiency. Some experts stressed the need of a long-term focus by jurisdictions in order provide a clear direction and increase certainty among actors as well as the need to enable local and regional authorities to more freely dedicated funds to building renovation initiatives. More targeted incentives and access to soft loan facilities are also deemed necessary for promoting deep renovations with financing been highlighted as a top priority. This could be accompanied with mandatory promotion of deep renovation standards in public subsidies (including energy efficiency obligation and white certificate schemes), increase of CO₂ taxes and introduction of housing tax penalties in case of excessive energy consumption. Technical assistance for OSS linked with national grants for refurbishment could also help create a better synergy, while transparency in energy consumption data can raise more awareness.

Name: [Superhomes](#)**Country:** IE**Description:**

Started as a pilot project in 2015, SuperHomes is an OSS designed by Tipperary Energy Agency and funded by the Sustainable Energy Authority of Ireland. It gives homeowners the opportunity to retrofit their pre-2006 houses to an 'A' energy rating standard. Based on a whole house solution, it includes the following mandatory measures to avail of financial support: heat pumps, airtightness improvements, advanced ventilation systems and insulation to a high standard. Depending on the project and grant targets, solar PVs may also be included. The financial support takes the form of a grant covering 35% of the upgrade cost with the option of spreading the remaining cost over five years via a loan.

Name: [Espace-Info-Energie, Toulouse](#)**Country:** FR**Description:**

Espace Info-Energie is a Toulouse-based OSS which, inter-alia, offers conferences and trainings on topics such as energy transition and financial aid at home. Espace Info Energie has been running "Positive Energy Families" since 2008, a challenge whose objective is to mobilize the general public on the energy savings that can be achieved on a daily basis, without affecting comfort. It takes place throughout the heating season, from December 1 to April 30 each year. During the 2015-2016 campaign, the challenge brought together nearly 8,000 participating households, totaling 8,500,000 kWh of energy savings, equivalent to taking 4,000 cars off the road.

Name: [Center for Sustainability, Heerlen](#)**Country:** NL**Description:**

The Center for Sustainability in Heerlen aims to offer an OSS-based solution inspired by the WoonWijzerWinkel model in Rotterdam. The goal is to support deep energy retrofits in houses occupied by energy poor households through cooperation with regional partners (see more details in Section 5.2).

Name: [HomeGrade](#)**Country:** BE**Description:**

Homegrade offers financial, technical and administrative assistance on energy renovation projects. They are likely to provide support to ambitious projects due to the stringent building standards in Brussels (see more details in Section 5.2).

Name: [Energiesprong](#)**Country:** FR, NL**Description:**

Set up originally as a government-funded pilot scheme in 2016, Energiesprong has supported whole house retrofits at no extra costs for the residents in over 5000 houses in the Netherlands. Since then, Energiesprong has scaled its model to more markets in Europe including France, the UK, Germany and Northern Italy. An Energiesprong retrofit aims to reach a net zero energy standard, meaning the building generates the total amount of energy required for its heating, hot water and electrical appliances. This is achieved by using new technologies such as prefabricated facades, insulated rooftops with solar panels, smart heating, and ventilation and cooling installations.

5.4 Role in dealing with energy poverty

In the European Union, more than 50 million households live in energy poverty, i.e. they do not have access to affordable, safe and reliable energy required to power normal appliances, light, and keep warm and cool. Such a condition deprives people of the essential means to live a good, satisfactory and just life, as it directly impairs their standards of living and health. In particular, the energy poor is not only more exposed to the risk of respiratory and cardiac illnesses due to uncomfortable temperatures, but also to the risk of mental health due to stress associated with the inability to pay energy bills.

Energy poverty is a complex but only recently acknowledged phenomenon, that is why it has gained increasing attention by scholars from different fields who have advanced new concepts, frameworks and approaches to capture its drivers and identify ways to tackle it ([Bouzarovski and Petrova 2015](#), [Middlemiss and Gillard 2015](#)). So far, four main factors have been identified as main causes of energy poverty: low income, inefficient dwellings, high-energy prices and inefficient behaviours ([Kearns, Whitley et al. 2019](#)). With these factors in mind, policy makers can design targeted policies aimed to tackle energy poverty. This is particularly the case for the European Union, wherein tackling energy poverty has become a policy priority since 2016 with the introduction of the 'Clean Energy for All Europeans' legislative package. In particular, the package proposes that Member States have to aim to alleviate energy poverty when implementing their long-term building renovation strategies and energy efficiency schemes⁵⁶. To date, Members States have implemented a number of policy interventions, like those aimed to protect the consumer, provide information and change behaviour, and support energy efficiency ([Pye and al. 2015](#)).

Of central relevance are certainly the latter: by promoting the improvement of the energy efficiency of the dwellings, these interventions have the potential to accrue benefits to both the most vulnerable (by lowering energy bills and improving health) and to the wider society (by lowering CO₂ emissions). Generally, national authorities promote energy efficiency through regulation, such as building codes, energy-efficiency obligation schemes, and energy performance standards, while regional authorities promote energy efficiency by directly encouraging private households to renovate their dwellings through financial incentives and information provision. In this context, OSS play a crucial role not only in supporting the effectiveness of energy efficiency policies by simplifying the complex decision-making process of renovating faced by consumers, but also and especially in supporting the fight against energy poverty ([Interreg Europe 2019](#)).

Recently, the report 'Maximising the energy efficiency potential of the EU building stock'⁵⁷ presented by Committee on Industry, Research and Energy of the European Parliament has also explicitly acknowledged the actions delivered by OSS as enabling the 'Renovation Wave' and stimulating the retrofitting of the housing stocks, with particular benefits for occupants that are at risk of energy poverty.

Notably, the energy poor do not have the financial capacities to invest in energy efficiency. In addition, they do not have a voice in the decision to renovate, as they generally rent the dwelling in which they live. A one-stop-shop approach might help bridge this financial and power gap. More particularly, OSS can assist vulnerable individuals in engaging their landlords to renovate. They can also assist the energy poor in loan or acquisition from banks or public authorities, provide funding via ESCO through savings on energy bills, or assist saving decisions in dedicated accounts ([Interreg Europe 2019](#)). On a broader perspective, by boosting their budgeting capacities, OSS have the potential to help the energy poor become actors of change and protagonists of the green transition ([DellaValle and Sareen 2020](#)).

The multiple stressors imposed by energy poverty conditions often lead vulnerable individuals to prioritize choices, such as the choices of inefficient energy appliances, which provide immediate benefits and worsen the already suboptimal economic conditions ([Shah, Mullainathan et al. 2012](#)). By promoting community trust ([Farah and Hook 2017](#)), a one-stop-approach might help dilute this tendency and promote more farsighted and efficient choices. As an example, OSS can help shift community-level energy culture and subsequent uptake of energy efficiency measures by promoting energy events with trusted community members working as facilitators or by involving individuals in the construction of partnerships with local and trusted actors (e.g. SMEs, financial institutions, energy agencies) ([Scott and al. 2016](#)).

⁵⁶ https://ec.europa.eu/energy/topics/energy-strategy/clean-energy-all-europeans_en

⁵⁷ European Parliament, draft report on 'Maximising the energy efficiency potential of the EU building stock' (2020/0000(INI)), 2020. https://www.euractiv.com/wp-content/uploads/sites/2/2020/04/Cuffe_report.pdf

Nine OSS were selected from the OSS database. Such OSSs include exemplary cases that are explicitly targeting social housing or vulnerable individuals, or that are directly claiming to pursue a social ambition. In the following, an overview of these OSSs explicitly or indirectly supporting the energy poor in Europe is presented.

Name: [RetrofitWorks](#)

Country: UK

Description:

RetrofitWorks is a 'not for private profit' co-operative that has been established with the aim to reduce CO2 emissions and people's energy bills, by offering a 'one-stop-shop' guaranteed retrofit installation. The key-members are the Advocates (local stakeholders and potential consumers) and Practitioners (certified and local retrofit SMEs). By matching communities & homeowners who want to retrofit their homes, with local, quality assured SME assessors and installers, RetrofitWorks promotes trust within the community. RetrofitWorks has also been the delivery partner organisation for Enfield Boroughs Scheme. This scheme specifically targeted vulnerable (those who were at risk of cold-related illness, have a disability or meet the responsibility for children criteria) and energy poor individuals with a grant of up to £4k to improve the energy efficiency of their dwelling. £200,000 of energy efficiency works to 59 properties were completed.

Name: [HomeGrade](#)

Country: BE

Description:

Homegrade provides free-of-charge support to individuals in the journey of reducing the energy consumption of their homes and their behaviours. In particular, in addition to provide advice to individuals on how to use energy in a rational way, it provides step-by-step technical and administrative advice on renovation projects. It also provides information and advice on existing financial aid. HomeGrade has also participated to the project MAEPE, a collaboration between three partners to explore the relationship between energy efficiency and energy poverty. The MAEPE project has enabled HomeGrade to improve the knowledge of the causes of energy poverty and unveiled mechanisms to tackle it. In particular, innovative practices were examined from the social (what kind of support is provided by each partner), technical (what kind technical innovation improve energy efficiency and reduce tenants' bills) and financial perspectives (which financial mechanisms are offered).

Name: [PadovaFit Expanded](#)

Country: IT

Description:

The EU funded project launched in 2019 and ending in 2022 aims at creating and piloting a One-Stop-Shop to promote home renovation services in the city of Padova. The OSS will support homeowners and stimulate both the demand and the supply sides to invest in energy efficiency, financially and technically. In particular, the project aims at improving the financing conditions for energy renovation investment plans offered by the One Stop Shop. This way, renovation works can be accessible to all inhabitants thanks to the more inclusive financing scheme. This project builds on the experience generated in the Padova FIT! EU funded project (PadovaFIT!) that was designed to specifically address energy poverty and energy refurbishment of private building stock of the city of Padova.

Name: [OpenGela](#)

Country: ES

Description: The EU funded project aims to develop integrated home renovation one-stop-shops for vulnerable districts in the Basque countries. The district offices will be designed to provide Basque citizens with support and advice on the renovation process from a technical point of view, without overlooking the social dimension. In particular, the approach will explicitly take into account the citizens' needs, with the aim to foster a cultural identity, mutual trust and universal accessibility. The approach will be piloted in two Basque districts classified by the Basque Government as "very vulnerable". The project started in 2019 and will end in 2022.

Name: [Reimarkt](#)

Country: NL

Description:

Reimarkt is a private company that combines the services of small and local suppliers to promote home renovations. It established five physical shops and one webshop to sell products to homeowners, by developing solutions that can be applicable to many different households. As the majority of households often do not qualify for financing, Reimart offers an inclusive financing scheme with the OSS acting as a representative.

Name: [BetterHomes \(BedreBolig\)](#)

Country: DK

Description:

Better Homes (BedreBolig) was a voluntary and market-driven Danish scheme that makes it easier for homeowners to renovate their homes thorough a one-stop-shop approach. The scheme was implemented from 2014 to 2016. In particular, the scheme provides homeowners with advice and information on energy efficient home renovations delivered by qualified advisors and building contractor. The advisors are trained by the Danish Energy Agency. Some municipalities provide grant funding to homeowners to cover up to 50% of the cost to develop the Better Homes Plan. As these strategies make the providers of electricity and gas have a more active role in providing households with the most relevant information to improve their homes, they also have the potential to affect in a positive way vulnerable households who can use that information to save energy and, in turn, their bills. In 2016, an external evaluation of the effectiveness of the scheme was carried out, with the final conclusion that it has not led to an increase in energy efficiency in Danish households. A point highlighted in the evaluation report was the perceived conflict perceived by homeowners when the independent advisor is also a professional contractor.

Name: [Center for Sustainability, Heerlen](#)

Country: NL

Description:

The city of Heerlen has joined the INNOVATE project to set up a physical One-Stop-Shop which will serve as "Center for Sustainability" on the model of the WoonWijzerWinkel in Rotterdam. In particular, the center will provide independent advice, cooperate with local companies, and evaluate quotations and offers for energy efficiency measures. Harleen's goal is to reach those residents who face economic instability and energy poverty by making deep energy retrofits feasible and affordable through the cooperation with regional partners. Reaching these residents is not only a way to reduce inequalities in the population, but also a way to promote deep energy refurbishments on a large scale, given that in Harleen the wide income gap between the rich and the poor combined with low housing prices, make deep renovations generally unaffordable and unattractive.

Name: [Espace-Info-Energie, Toulouse](#)

Country: FR

Description:

Toulouse inhabitants can benefit from free advice on how to save energy and switch to renewable energies at the one-stop-shops Espace Info-Energie (currently there are 22 throughout the city). Espace Info-Energie also offers conferences on topics ranging from energy transition to financial aid in the home. Notably, since 2015, Espace Info Energie has been running a free training course on Energy Poverty for social workers called "Understanding for better action". The aim of the training is to provide the tools to understand how to qualify and quantify energy poverty in France, the basic notions (energy, thermal comfort and indoor air quality), how to compute the consumption rations, and how to identify key energy-saving actions to alleviate energy poverty.

Name: [RenoBooster](#)

Country: AT

Description:

The EU project led by the City of Vienna aims at developing a one-stop-shop to support home owners and administrators in the planning, execution and financing of house renovations. The key-actors of the project represent the municipal administration, the real estate industry, energy consulting and opinion research. The project also aims to analyse the current legal framework conditions and subsidies, to propose improvements on the regulatory and subsidies framework and enable a better access to financing for renovations. The project started in May 2019 and will end in October 2022.

In Europe, there are only a few examples of OSS targeting the issue of energy poverty. Among those who do, energy poverty is addressed only indirectly. In particular, through the provision of financial advice or innovative financial mechanisms, OSS have the potential to tackle the financial gap faced by individuals who cannot access funding, who are mostly the most vulnerable in the society. Second, through the provision of trusted information on how to save energy as well as through the involvement of local actors, OSSs have the potential to tackle the trust and information gap faced by vulnerable individuals who might engage in inefficient energy behaviours.

The exemplary OSS in UK, NL, ES and FR explicitly prioritize the fight against energy poverty and inequalities. These OSS have or are implementing activities and projects with the specific ambition to tackle and understand the causes of energy poverty. The actions take the form of an all-inclusive support for renovation works, as well as special trainings for key-advisors that might help empower vulnerable households on how to reduce their energy bills.

An avenue for future action by OSSs would be developing trainings for key-advisors to boost explicitly vulnerable individuals' budgeting capacities. As an example, key-advisors might empower vulnerable individuals on how to increase their savings in dedicated accounts applying behavioural insights, such as commitment devices (DellaValle, 2019).

As for the nature of OSSs, the majority of the current examples stems from European projects or mirrors the local political commitment to promote energy renovations and increase society's wellbeing. There are, however, also bottom-up initiatives, like the cooperative in the UK, which might result from a shared community need. This heterogeneous European picture also echoes the different ways in which Member States perceive energy poverty as a separate issue to tackle⁵⁸.

⁵⁸ Towards an inclusive energy transition in the European Union: Confronting energy poverty amidst a global crisis, 2020, <https://op.europa.eu/en/publication-detail/-/publication/4a440cf0-b5f5-11ea-bb7a-01aa75ed71a1/language-en>

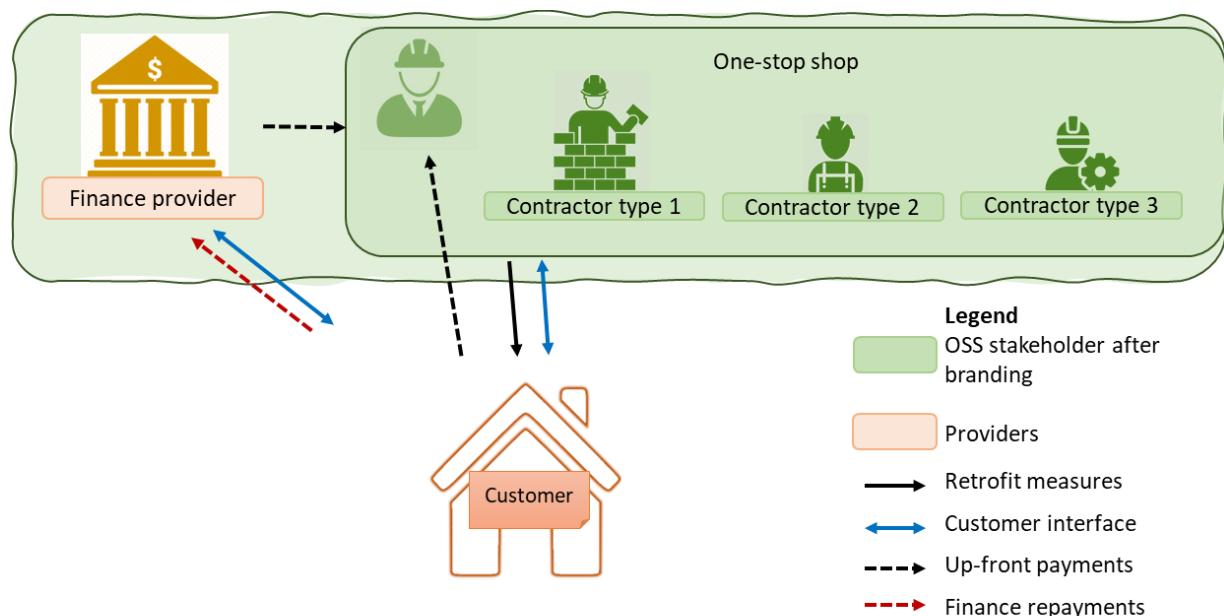
6 Conclusions and recommendations

One-stop shops carry out building renovations with an energy performance focus, helping building owners, managers and tenants to overcome organisational hurdles, management difficulties and financial challenges. They do not drastically increase the size of the population that is willing to or plans to implement energy renovations, instead OSS assist those building owners and tenants who are already considering to renovate. They help motivated owners and tenants to overcome difficulties that would otherwise prevent them from action, or make the implementation of the refurbishment slow or costly.

One-stop shops (OSS) provide holistic, integral solutions for (typically) residential building renovation, even towards nZEB for reasonable costs and good quality. One-stop shops are transparent and easily accessible facilitation tools from the clients' perspective; and innovative business models from the suppliers' perspective. An OSS overcomes the market fragmentation on both the demand side and the supply side by offering holistic, whole-value-chain renovation solutions.

In the one-stop shop model, the OSS stands in the middle of an energy renovation stakeholder map and subcontracts all other contractors, occasionally even the financial actor (Figure 25). The OSS practically **represents and manages the whole (or large part) of the customer chain**. The customer receives **all information, all contract, all management** from the OSS.

Figure 25. The One-stop shop model



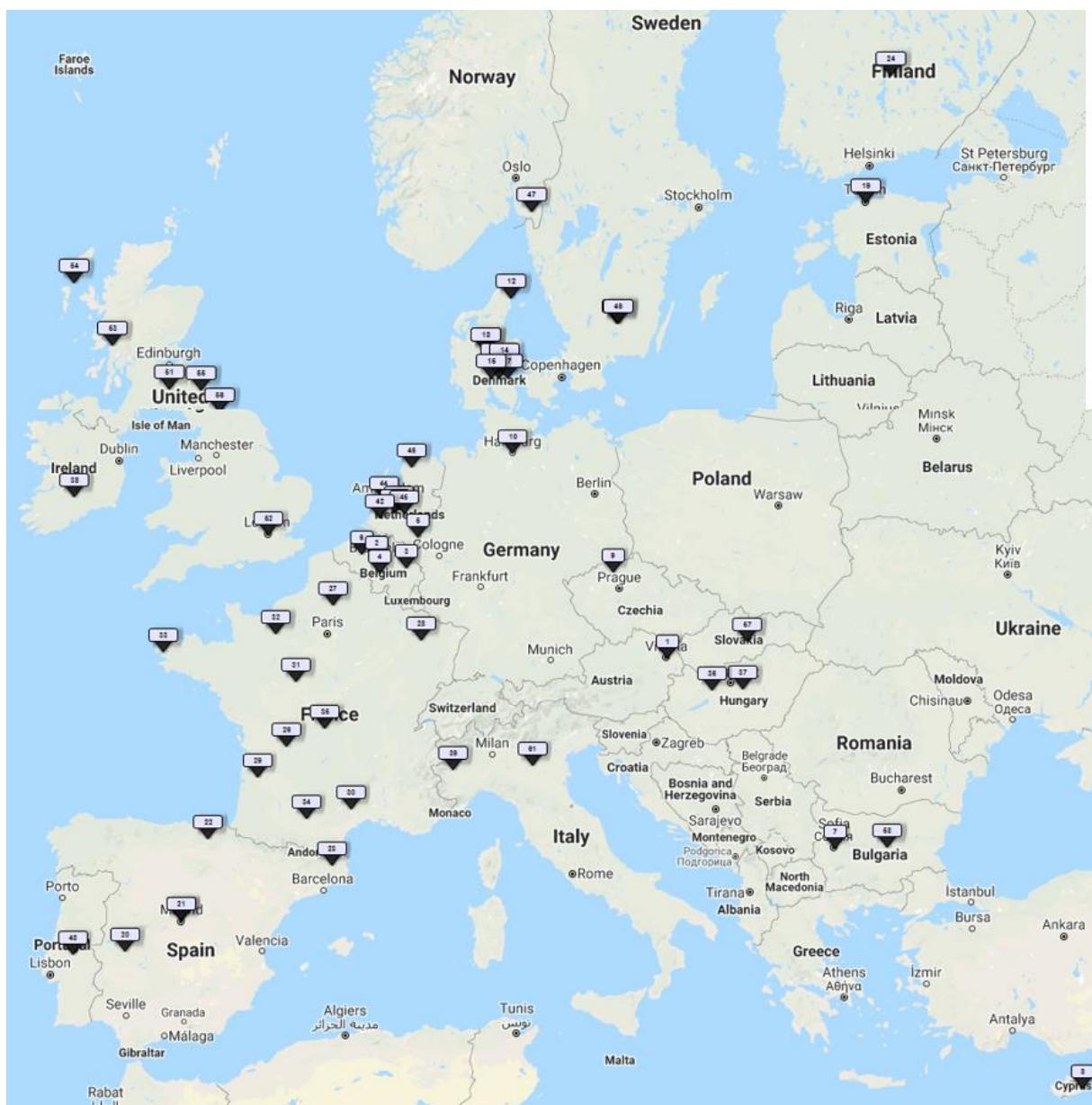
Own graphic based on Brown (2018)

6.1 Summary of the European OSS map and its potential

Based on the information on the **63 OSS identified in the EU** in this report, the current level of activity of the European OSS market is slightly above 100.000 projects per year. The identified conditions, namely favourable policy environment, availability of financing, experience sharing, transfer of models within countries and across countries, implies that the OSS market is on the rise.

Of the 63 OSS, **57 were operational in 2020**. Around 2/3 of the EU Member States have at least 1 OSS on their renovation markets (Figure 26). **OSS have increased in numbers and activity in the last 5-10 years**: 70% of the OSS were launched after 2012, and only about 10% of the OSS identified has stopped being stopped (see Figure 21).

Figure 26. The location of one-stop shops identified in Europe.



Source: own compilation

Numerous examples of business model transfer within and across countries were shown in Section 4. To reach the European energy and climate goals, with an annual renovation rate of 3.4%/year, almost 23,000 homes would have to be renovated daily until 2050 ([Flanagan and Deacon 2018](#)). This is equivalent to renovating more than all of the homes in Paris, London and Berlin every year. **If the OSS renovation volume is replicated to ten-fold, then OSS may cover about 10-15% of the desired renovation rate per year** at low costs and with client-friendly methods.

Even though there is a strong business potential for one-stop-shop energy renovation concept, **it has been difficult to start or run such a business**, e.g. Dong Energy Cleantech and ENRA concepts have ceased to operate⁵⁹. One of the main reasons is the uncertainty about the customer base. There is a lack of awareness about the possible energy efficiency measures and their benefits. The uncertainty regarding the level of energy savings, partly due to a varying household energy behaviour and lack of standardised measurements and verifications protocol may not encourage, both the customers and financiers, to go for energy efficiency

⁵⁹ http://www.financingbuildingrenovation.eu/wp-content/uploads/2017/09/krushna_study_first_page.pdf

investments. High investment cost is an obstacle for energy efficiency renovations. In Nordic countries mortgage financing seems to be the most cost efficient option to finance such investments for single-family houses. Banks are willing to lend money to those homeowners whose existing house loan is significantly lower than the value of the house and the household income is sufficient to cover an increase of the loan. This suggests that people who have lived in a house for long time and paid back most part of their mortgage have the financial capacity to invest in energy efficiency renovation. However, people who availed mortgage financing to buy a house recently may find it difficult to avail additional mortgage financing to invest in energy efficiency renovation, even though they are much likely to be interested in such renovations. One option to address this issue is that banks may consider an energy efficient renovation plan prepared by an entrepreneur and pre-evaluate the post-renovation value of the house in collaboration with real estate agents. This evaluation could form the basis for the bank to confirm the homeowner and the entrepreneur that certain amount of investment cost would be covered by mortgage financing.

6.2 Success factors and challenges

The European building market is typically top down and supply driven, with a discrepancy among the offered products and the end-users needs and affordability.

The OSS are in a position that they can **bridge this gap between the users and the construction supply side, and therefore increase the actual renovation rate by moving potential clients through the last steps of decision**. The OSS services are effective because:

- ✓ They are locally embedded, know the local market, the local clients and the local conditions;
- ✓ They have an interactive relationship with the clients;
- ✓ They can follow-up even on finished projects;
- ✓ They can accelerate building refurbishments by informing, motivating, as well as by assisting building owners to follow through energy efficiency investments, by providing support from the start to the end;
- ✓ They can facilitate interested, but not yet committed energy users/asset owners to actually implement an energy saving measures or other sustainable projects;
- ✓ They can facilitate access to financing and occasionally offer better rates;
- ✓ They
- ✓ They can even potentially improve the average renovation depth in terms of energy performance through the holistic approach;
- ✓ Sometimes they can reach out to vulnerable populations, such as tenants of social houses, and contribute to tackle energy poverty.

It is important to note that OSS do not only renovate a home. Their work goes beyond the single project, for example by having positive effects on the community and the neighbourhood. They help the current tenants to improve their living conditions and thus stay in the area. These renovation programs may even renovate whole neighbourhoods. For example, the Haarlemse Huizenaanpak was developed pursuing earlier initiatives of local residents and contractors. The OSS grew out from neighbourhood communities, locally active architects and construction businesses, who searched for local clients, contacted the municipality, and adopted ambitious energy goals at district level, and act as renovation facilitator for the area. The OSS partners and the clients belong to the local community, and enhance their own living or working environment.

6.2.1 Success factors

The key benefit of OSS in Europe is their ability to enhance building renovation in the residential sector and offer holistic solutions. With the help of OSS, the renovations can more easily encapsulate a whole-building approach, and with proper financial products foster even deep renovations. While all energy efficiency projects could be good candidates for OSS, they are particularly well suited to overcome the fragmentation barrier typical of the residential buildings, and especially of single houses. Therefore, OSS are less frequent in the public sector, or non-building sectors (e.g. lighting, appliances).

OSS touch on the main motivators of clients for energy renovation:

- ✓ **general and thermal comfort** (keeping warm, keeping cool, providing a place for recharge, being convenient);
- ✓ **saving money** on energy costs;
- ✓ improving the sale value of the building
- ✓ ensuring a **healthier environment** (including noise particularly);
- ✓ protecting the environment by reducing emissions;
- ✓ changing the style or giving a new look;
- ✓ social pressure.

In addition, **OSS have their specific success factors** that build on the values of energy efficiency improvement listed above (based on Vandewiele, Cuypers et al. (2016) and own data):

- ✓ **Personal approach:** OSS have a direct contact to the clients, as well as to their contractors. They are all locally embedded. OSS often succeed through “door knocking”. Successful OSS have built on this integration by approaching and involving local governments, building on programmes from before where they got to know the potential clients, they appear at local markets and fairs.
- ✓ **Unburdening:** OSS provide active guidance, making it less complex and time-intensive for all types of expertise: financial, technical, organizational.
- ✓ **Independent decisions:** Homeowners can make an independent decision and are not forced into a solution, because the OSS supports them with a holistic picture instead of pushing a specific product or solution.
- ✓ **Independent advice:** People can rely on the advice, as most OSS do not cover interests of certain companies or solutions, it builds trust and confidence with the homeowners.
- ✓ **Free experts:** Many OSS provide advice for free, and clients can better decide afterwards whether to go along the recommendations or postpone the decision, or to go for alternatives.
- ✓ **Targeted recruitment of clients:** There is a certain type of potential client that OSS have a larger success rate with, because they can facilitate the decisions of already motivated and partially prepared population.
- ✓ **Timing:** building owners and tenants are more likely to renovate, when the homes are empty, i.e. at the time of transaction (rent or sale).
- ✓ **Collaborators:** Working with other actors, for example with estate agents who have direct approach to the clients in the most receptive life-stage can help reach to the most receptive group of clients.
- ✓ **Peer pressure:** OSS better succeed when they have a link to community leaders or peers, who then represent or explain the refurbishment idea and solutions to the larger community.
- ✓ **Ambassadors:** Involvement of ambassadors that homeowners trust, e.g. a cooperation with a rural area organization.
- ✓ **Incentives:** Providing financial and non-financial incentives, like new information (e.g. a thermo-photo), a smart meter, a tailored feasibility plan, discount on products and service improves the interest and longer involvement of the potential client.
- ✓ **Energy savings guarantee:** Although the main motivation has been found to be other than cost savings through energy performance improvement, the economics still remain a crucial part of the renovation works. If energy cost savings can significantly decrease the total costs, and energy savings can be guaranteed (e.g. by EPC), clients will trust the scheme more.
- ✓ There are OSS, which offer **insurance** as part of their value proposal or as their main product. Building sites are inherently dangerous places. The owner of the project (and typically of the home) has liability to others, including the workers, themselves, family, visitors, tenants or employees. Some of this liability can be contracted out through companies such as Renovation Underwriting.
- ✓ **Government:** Involving the local or regional governmental in the program can reduce the costs of the OSS, because the government may promote energy renovation in general, or even the OSS solution itself, while it increases trust by the clients.

6.2.2 Barriers overcome

In fact, energy efficiency per se is not the main driver, but an additional benefit ([Abreu, Oliveira et al. 2017](#)). On the other hand, citizens are **primarily held back by** (a) **money**, (b) **the (expected) hassle**, and (c) a **lack of (procedural) awareness**. These factors are much varied across countries ([Ipsos 2018](#)). OSS have the skills and resources to overcome some of the key barriers to energy renovation (compare to Table 7.)

Table 19. Barriers to energy renovation of homes and the solution provided by OSS.

Barrier	Description of the barrier	OSS solution
Economic	Upfront costs	<ul style="list-style-type: none"> ✓ High investment costs ✓ Delayed benefits
	Need for loan	<ul style="list-style-type: none"> ✓ Creditability ✓ Loan aversion
	Split incentives	<ul style="list-style-type: none"> ✓ Landlords might underinvest under the fear of not being able to recoup the costs of investments in the rent
Information	Information asymmetries / contractor risk	<ul style="list-style-type: none"> ✓ Unknown quality of work ✓ Lack of trust ✓ Low contractor credibility
	Incorrect beliefs	<ul style="list-style-type: none"> ✓ Incorrect beliefs over future benefits of an energy efficiency renovation ✓ Misperception of energy use
Decision-making	Outcome uncertainty	<ul style="list-style-type: none"> ✓ Some OSS have online tools for self-analysis of energy performance, which can visualize the energy consumption and compare to peers and literature values.
	Limited attention	<ul style="list-style-type: none"> - ✓ Experience based offers and knowledge collected at the OSS (demonstrating these via exemplary projects); ✓ Tailored package and personalized advice; ✓ Risk transfer to OSS (as ESCOs), guarantees.
		<ul style="list-style-type: none"> ✓ Imperfect information-processing capacities (people base their choices on the elements that capture their attention more) ✓ Appropriate timing, e.g. at the time of home transfers ✓ Building on other triggers than energy efficiency, and integrating comfort, structural renovation into

		the package.
Social invisibility	Weak social signalling/comparison	<ul style="list-style-type: none"> ✓ Many OSS disseminate their solution via peer-information; ✓ Several OSS are cooperatives, or owned by the local community; ✓ Some OSS demonstrate finished projects on their website; ✓ OSS showcase the value of energy renovation.
Cognitive burden	High transaction cost of searching for information	<ul style="list-style-type: none"> ✓ Knowledge and skills offered as part of the service; ✓ Selection and organisation of contractors by OSS; ✓ Assistance in financing plan and application. ✓ Simplification: Single contractor (the OSS), which mediates between all contractors and the client; ✓ The OSS helps in other , public service help, quick renovation solutions (industrialized packages)
Loss aversion	<p>Anticipated disturbance, stress, inconvenience, resources, efforts to carry out the renovation</p> <p>Anticipated loss of options with irreversible investments</p>	<ul style="list-style-type: none"> - OSS provides customer care; ✓ ✓ OSS provide advisory services and disseminate information on renovation benefits ✓ There are innovative approaches explored by some OSS (e.g. by Reimarkt in the Netherlands or Huisdokter in Belgium) to collaborate with real estate agents (see more in chapter 4.6) to mitigate resources, time and efforts required from the client
Status quo bias/ sunk cost fallacy	<p>Psychological commitment to status quo and costly investments made in the past</p> <p>Shallow renovations limit the cost saving and environmental impact of the projects and block further improvements because of lack of willingness to start a new renovation</p>	<ul style="list-style-type: none"> ✓ Demonstration projects, past examples by OSS; ✓ Tailored package and personalized advice; ✓ Step-by-step renovation possibility (some OSS). ✓ There are OSS that follow-up shallow renovations and encourage homeowners to take a next step (e.g. using EnerPHit planning – see more in chapter 5.3)

Source: Own data collection based on ([Wilson, Crane et al. 2015](#)) and ([Interreg Europe 2019](#)), combined with data from the OSS survey.

6.2.3 Failure factors

The decision process that leads to an actual renovation is vulnerable to **drop-outs** ([Vandewiele, Cuypers et al. 2016](#)). In such moments **homeowners lose momentum**, and do not finally engage in the renovation process, and leave the ‘customer journey’ (see the Figure 8). There are some “**moments of truth**” where homeowners decide to go further or not. This is also called a “**funnel**”:

- ◊ An **unexpected or even foreseen life event** that occupies their attention: divorce, small kids, funeral;
- ◊ **Unexpected financial expenses**: Energy renovation is usually a heavy investment, and competes with other investments of the homeowner. Energy renovation is put at the bottom of the homeowner to-do list especially if there are other heavy financial posts up ahead, e.g. dental work, change of car, etc.
- ◊ The size of **investment required is larger** than expected: After the financial plan is prepared, some households realize that they would not want to spend the amount of budget as defined.
- ◊ Realizing the **lack of financing**: Connected to the above, many homeowners do not have enough savings to finance the renovation, and need funding from e.g. a bank. An important drop-out moment

occurs when the homeowner concludes he does not get a loan, e.g. after a dialogue with a financial institute. It is possible that they hoped for easier access to finance when participating in the renovation program. A similar event is when a subsidy scheme is stopped.

- ◊ The moment the **homeowner is confronted with the building sector**: For some homeowners, this confrontation may lead to unpleasant experiences, which can lead to a drop-out.
- ◊ The moment the **trust in the scheme has decreased too much**: Certain events can harm the confidence in the (potential) contractors. For example the moment of waiting for the next step can be a moment for drop-out if the process is not smooth enough, if homeowners get contradictory information (e.g. from scheme experts, from the building sector, from friends and relatives), if the renovation coaching does not offer the right social and technical skills, etc.
- ◊ The moment a **decision needs to be taken with co-homeowners**: while discussing with co-owners or co-habitants, and especially in the case of multiapartment buildings, which require a majority decision.

The reviewed OSS have a large set of strategies to reduce the number of drop-out moments, which have been summarized in sections above, e.g. section 6.2.1. Vandewiele, Cuypers et al. (2016) listed further factors that can lead to problems also in an OSS project:

- Working with volunteers can prove risky, because they might not always be available if there is a strict timing;
- An unbalance of the contractors' architecture, whereas some of them have to put more resources in, while others win more, resulting in difficulties in keeping the contractors on board;
- Reliable collaborators are essential to keep the overall quality of the service at high level. Trainings and regular motivation for contractors can help to stay on track.
- Too much focus on awareness raising: OSS are mostly successful with already motivated homeowners, therefore providing advice and consultation to people that are not motivated yet might be of little use if the resources invested will not pay back in time.

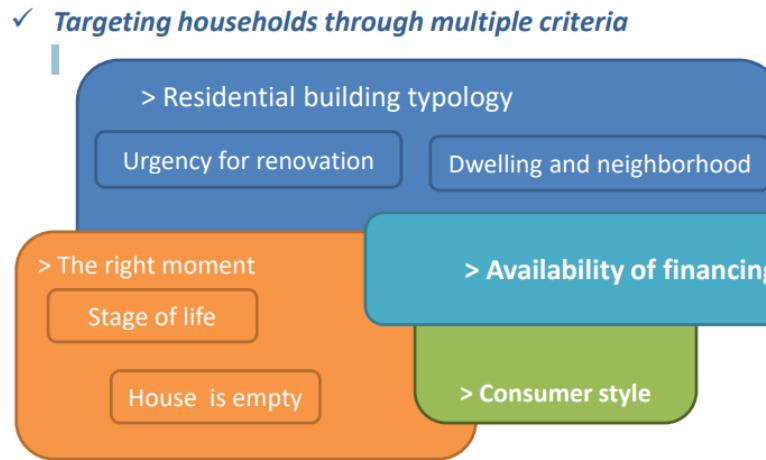
6.3 Recommendations

Several of the barriers to general home energy renovations (as reviewed in chapter 2.3) can be overcome by one-stop shops (Table 14). However, OSS are not a silver bullet, and therefore, they help a certain segment of the market, and should be well-aligned with other market players, and policies.

Potential clients of OSS can be identified taking into account several factors listed in this report:

- ✓ Mostly **residential building owners**, but tenants can also work with OSS because of the direct benefits;
- ✓ OSS will impact not only the specific dwelling, but also the **neighbourhood**;
- ✓ Identifying the **right ambassador** (especially in case of non-single buildings);
- ✓ Finding the clients in **the right time**, focusing on the stages in their lives when the home is empty, i.e. at the time of transaction, or at least when other renovation works are done;
- ✓ **Financing** needs to be secured;
- ✓ Clients who already have **motivation** are the most important targets of OSS.

Figure 27. Key criteria of the right timing and scoping of clients.



Source: ([Refabert 2019](#))

6.3.1 Improve complexity and renovation time

Building renovation is a complex and time-consuming investment with significant budget that homeowners need to carefully reconsider. While OSS reduce the hurdle, the risk, and the time needed to invest in the project, further simplifications and security can be increased. For example by:

- ✓ Combining energy refurbishment with other refurbishment aims: Partnership with transaction companies for the right timing;
- ✓ Prefer single, large and holistic interventions over step-by-step approach, but do not decline the latter, because homeowners may be more willing to set aside budget and time in a regular manner rather than all at once;
- ✓ Reducing costs and time via standardization, e.g. using pre-fabricated technical elements
- ✓ Or by standardization of the process;
- ✓ Packaging of interventions for quick screening and first contact with the clients;
- ✓ Nevertheless, go on to tailoring the specific needs;
- ✓ Costs of financing can be reduced by a combination of financial instruments, such as grants, tax relief, bank loans and own financing. Using innovative financing (EPC, PACE, etc.) may involve other security and contractual elements.

6.3.2 Enabling by policies

One-stop shops basically work as a business concept. Nevertheless, they do interact with policies at EU, national and local levels, and it is possible to enhance the impact of OSS on energy renovation rate and depth by reviewing the policies that support or hinder their success. The following structural, legislative, financial, and information policies were identified to have contributed positively to energy renovations through OSS.

Table 20. Enabling policies to multiply renovation projects through OSS.

Type of policy	Policy example	Relevant jurisdiction level(s) of
Structural	<ul style="list-style-type: none"> ✓ Horizon Europe projects that enable business model transfer and experience sharing; ✓ Climate and energy targets (EU, national and city levels); ✓ Renovation pledges; ✓ Administration and public sector to lead by example in successful building renovation. 	   
Legislative	<ul style="list-style-type: none"> ✓ Energy efficiency policy framework (EU, national and local levels) ✓ Energy regulation for individual houses. ✓ Renovation Wave 	   
Financial	<ul style="list-style-type: none"> ✓ EIB funds, ELENA, PDA, Horizon Europe projects for research and innovation ✓ National subsidies, tax reliefs ✓ EEOs ✓ Local grants or tax reliefs ✓ Loans should be linked to the buildings, e.g. collected with utilities instead of being personal; ✓ Removing barriers to ESCO/EPC. 	   
Informational	<ul style="list-style-type: none"> ✓ Horizon Europe projects to promote building renovation, especially deep renovation and information dissemination in general and about business models; ✓ Information campaigns and promotion at the national or local levels, possibly leveraging behavioural insights for a bigger outreach. 	   

Note:  = EU level;  = national level;  = regional level;  = local level

Source: own data

6.3.3 Enabling going as deep as possible through policies

The 2018 EPBD revision has highlighted the need for more policies and actions to stimulate cost-effective deep renovation of buildings, including staged deep renovations.

Although traditionally the OSS model is not compatible with the concept of deep renovations as OSSs are geared towards shallow, low-hanging fruit investments, a few OSS have been found to promote deeper renovations. OSS can be further encouraged to move towards deeper renovations by compensating the financial losses and risks, raising awareness among homeowners to request for such services, and awarding the environmental and climate benefits for the society.

National or regional compulsory renovation programmes, mandatory renovations for all public buildings and other renovation rate linked obligations and pledges would provide a basis for more commitment. Local and regional authorities could provide dedicated funds to building renovation initiatives, whereas the financing should only be given to renovation measures that are economically not attractive. This could be accompanied with mandatory promotion of deep renovation standards in public subsidies (including energy efficiency obligation and white certificate schemes), increase of CO2 taxes and introduction of housing tax penalties in case of excessive energy consumption. Technical assistance for OSS linked with national grants for refurbishment could also help create a better synergy, while transparency in energy consumption data can raise more awareness. Finally international sharing of experience would contribute to spreading best practices.

6.3.4 Enabling energy poverty alleviation goals through OSS

A few examples of OSSs were identified in this research that contributed to the social goals of alleviating energy poverty through improved housing. In particular, through the provision of financial advice or innovative financial mechanisms, OSSs have the potential to tackle the financial gap faced by individuals who cannot access funding, who are mostly the most vulnerable in the society. Second, through the provision of trusted information on how to save energy as well as through the involvement of local actors, OSSs have the potential to tackle the trust and information gap faced by vulnerable individuals who might engage in inefficient energy behaviours. Finally, some OSS have special programs for social housing establishments.

References

- Abreu, M., R. Oliveira and J. Lopes (2017). "Attitudes and Practices of Homeowners in the Decision-making Process for Building Energy Renovation." *Procedia Engineering* **172**: 52-59.
- Allcott, H. and T. Rogers (2014). "The Short-Run & Long-Run Effects of Behavioral Interventions: Experimental Evidence from Energy Conservation." *American Economic Review*.
- Artola, I., K. Rademaekers, R. Williams and J. Yearwood (2016). Boosting building renovation" What potential and value for Europe?: 66.
- Bastian, Z. (2016). Step by step retrofits with passive house components. Darmstadt, Germany, Passive House Institute.
- Bertoldi, P., M. Economidou, V. Palermo, B. Boza-Kiss and V. Todeschi (2020). "How to finance energy renovation of residential buildings: Review of current and emerging financing instruments in the EU." *WIREs Energy and Environment* **n/a(n/a)**: e384.
- Bolig Enøk (2012). Success Families.
- Bouzarovski, S. and S. Petrova (2015). "A global perspective on domestic energy deprivation: Overcoming the energy poverty–fuel poverty binary." *Energy Research & Social Science* **10**: 31-40.
- Boza-Kiss, B. and P. Bertoldi (2018). One-stop shops for energy renovations of buildings: Case studies. *One-stop shops in the EU*. P. Bertoldi. Ispra, Italy, European Commission. **1**: 64.
- Boza-Kiss, B., S. Moles-Grueso and D. Urge-Vorsatz (2013). "Evaluating policy instruments to foster energy efficiency for the sustainable transformation of buildings." *Current Opinion in Environmental Sustainability* **5**(2): 163-176.
- Brady, T., A. Davies and D. Gann (2004). "Creating value by delivering integrated solutions." *International Journal of Project Management* **23**(5): 360-365.
- Bravo, G., G. Pardalis, K. Mahapatra and B. Mainali (2019). "Physical vs. Aesthetic Renovations: Learning from Swedish House Owners." *Buildings* **9**(12).
- Brown, D. (2018). "Business models for residential retrofit in the UK: a critical assessment of five key archetypes." *Energy Efficiency* **11**: 1497-1517.
- Brown, D., S. Sorrell and P. Kivimaa (2019). "Worth the risk? An evaluation of alternative finance mechanisms for residential retrofit." *Energy Policy* **128**: 418-430.
- Buildings Performance Institute Europe (BPIE) (2017). Factsheet: 97% of buildings in the EU need to be upgraded. Brussels, Belgium, BPIE.
- Cirman, A., S. Mandic and J. Zoric (2011). What determines building renovation decisions? The case of Slovenia. *Enhr Conference*. Toulouse.
- Cluett, R. and J. Amann (2015). Multiple benefits of multifamily energy efficiency for cost-effectiveness screening.
- Colclough, S., O. Kinnane, N. Hewitt and P. Griffiths (2018). "Investigation Of nZEB Social Housing built to the Passive House Standard." *Energy and Buildings* **179**.
- Csoknyai, T., E. Barna, L. Formanek, G. Igaz and Z. Zorkóczy (2013). A gazdaságos felújítás [Cost efficient renovation]. Budapest, Hungary, Belügyminisztérium [Ministry of Internal Affairs].
- Davies, A., P. Tang, T. Brady, M. Hobday, H. Rush and D. Gann (2001). *Integrated Solutions: The new economy between manufacturing and services*. Brighton/London, UK, University of Brighton.
- De Groote, M. (2015). *Defining nZEB standards for renovations*. Final Conference of COHERENO project, Brussels, Belgium, COHERENO.
- De Groote, M. and M. Lefever (2016). Driving transformational change in the construction value chain. Brussels, Belgium, BPIE.
- DellaValle, N. and S. Sareen (2020). "Nudging and boosting for equity? Towards a behavioural economics of energy justice." *Energy Research & Social Science* **68**: 101589.

DellaValle, Nives. "People's decisions matter: understanding and addressing energy poverty with behavioral economics." *Energy and Buildings* 204 (2019): 109515.

Dixon, T. and M. Eames (2013). "Scaling up: the challenges of urban retrofit." *Building Research & Information* 41(5): 499-503.

EEA (2020) Trends and projections in Europe 2020. from <https://www.eea.europa.eu/publications/trends-and-projections-in-europe-2020>

Enerdata (2019). Odyssee Key Indicators. [Odyssee-Mure database](#).

Enerdata (2019). Sectoral Profile - Overview, Drivers of Energy Consumption Variation. [Odyssee-Mure database](#).

Energy Club (2014). Refurbishment at our doorsteps. Budapest, Hungary, Energy Club.

European Commission (EC) (2015). Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee, the Committee of the Regions and the European Investment Bank – A framework strategy for a resilient energy union with a forward-looking climate change policy. Brussels, Belgium, European Commission. **25 February 2015**.

European Commission (EC) (2016). Comission Staff Working Document Impact Assessment, Accompanying the document Proposal for a Directive of the European Parliament and of the Council amending Directive 2010/31/EU on the energy performance of buildings.

European Commission (EC). (2019). "Energy performance of buildings directive." Retrieved 16 September 2019, 2019, from <https://ec.europa.eu/energy/en/topics/energy-efficiency/energy-performance-of-buildings/energy-performance-buildings-directive#facts-and-figures>.

European Commission (EC) (2019). The European Green Deal. Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions. [COM\(2019\) 640 final](#). E. Commission. Brussels, Belgium, European Commission. **COM(2019) 640 final**.

European Commission (EC) (2020) A Renovation Wave for Europe - greening our buildings, creating jobs, improving lives. Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions. COM (2020) 662 final. E. Commission. Brussels, Belgium, European Commission. European Commission (EC) (n.d.). EU Buildings Database.

Fabbri, M. (2018). "Clean Energy Package: Why buildings matter." <http://bpie.eu/news/buildings-in-the-clean-energy-package-a-bpie-guide/> 2019.

Farah, M. J. and C. J. Hook (2017). "Trust and the poverty trap." *Proceedings of the National Academy of Sciences* 114.21: 5327-5329.

Flanagan, B. and A. Deacon (2018). Renovation Roadmap: Making Europe's homes fit for the 21st century. Cambridge, UK, University of Cambridge Institute for Sustainability Leadership (CISL), The Prince of Wales's Corporate Leaders Group.

Galvin, R. and M. Sunikka-Blank (2014). "The UK homeowner-retrofitter as an innovator in a socio-technical system." *Energy Policy* 74: 655-662.

Gnoth, D. (2013). Moving home and changing behaviour – implications for increasing household energy efficiency. *ECEEE 2013 Summer Study – Rethink, Renew, Restart*. Belambra Les Criques, Toulon/Hyères, France, ECEEE.

Gram-Hanssen, K. (2014). "Existing buildings – Users, renovations and energy policy." *Renewable Energy* 61: 136-140.

Grasset, H. and E. Scoditti (2019). EE renovation market mechanisms, trends and barriers. [SusTainable bUsiNess models for the deep reNovation of builDiNGs \(STUNNING\) project](#).

Harrison, H., M. Birks, R. Franklin and J. Mills (2017). [Case study research: Foundations and methodological orientations](#). Forum Qualitative Sozialforschung/Forum: Qualitative Social Research.

International Energy Agency (IEA) (2019). Multiple benefits of energy efficiency. Paris, France.

Interreg Europe (2019). Supporting energy renovation of private households through One-Stop-Shops. A Policy Brief from the Policy Learning Platform on Low-carbon economy.

Ipsos (2018). Uncover the underlying motivations and barriers for energy efficient renovations. Amsterdam, the Netherlands, European Climate Foundation.

Kearns, A., E. Whitley and A. Curl (2019). "Occupant behaviour as a fourth driver of fuel poverty (aka warmth & energy deprivation)." *Energy policy* **129**: 1143-1155.

Klöckner, A. C. and A. Nayum (2016). "Specific Barriers and Drivers in Different Stages of Decision-Making about Energy Efficiency Upgrades in Private Homes." *Frontiers in Psychology* **7**: 1362.

Mahapatra, K. (2019). One-stop shop service in Sweden for renovation of detached houses. *One-stop shops in the EU: Role in building renovation*. P. Bertoldi. Brussels, Belgium, European Commission, JRC.

Mantzios, L., T. Wiesenthal, N. A. Matei, S. Tchung-Ming, M. Rozsai, P. Russ and A. S. Ramirez (2017). JRC-IDEES: Integrated Database of the European Energy Sector: Methodological note Sevilla, Spain, European Commission, Joint Research Centre.

Michelsen, C. C. and R. Madlener (2013). "Motivational factors influencing the homeowners' decisions between residential heating systems: An empirical analysis for Germany." *Energy Policy* **57**: 221-233.

Middlemiss, L. and R. Gillard (2015). "Fuel poverty from the bottom-up: Characterising household energy vulnerability through the lived experience of the fuel poor." *Energy Research & Social Science* **6**: 146-154.

Mørck, O. C. (2017). "Energy saving concept development for the MORE-CONNECT pilot energy renovation of apartment blocks in Denmark." *Energy Procedia* **140**: 240-251.

MORE-CONNECT project. (2019). "One-stop-shop concept: What is a 'One-Stop Shop'." from <https://www.more-connect.eu/one-stop-shop-concept/>.

Mortensen, A., P. Heiselberg and M.-A. Knudstrup (2016). "Identification of key parameters determining Danish homeowners' willingness and motivation for energy renovations." *International Journal of Sustainable Built Environment* **5**.

Mwangi, W. (2019). "European Commission launches Green Deal to reset economic growth for carbon neutrality." IISD/SDG Knowledge Center <https://sdg.iisd.org/news/european-commission-launches-green-deal-to-reset-economic-growth-for-carbon-neutrality/> 2019.

Palm, J. and K. Reindl (2018). "Understanding barriers to energy-efficiency renovations of multifamily dwellings." *Energy Efficiency* **11**(1): 53-65.

Pardalis, G., B. Mainali and K. Mahapatra (2019). "One-stop-shop as an innovation, and construction SMEs: A Swedish perspective." *Energy Procedia* **158**: 2737-2743.

Pato, Z. and et al. (2020). ENEFIRST D2.1. report.

Pihelo, P., T. Kalamees and K. Kuusk (2017). "nZEB renovation with prefabricated modular panels." *Energy Procedia* **132**: 1006-1011.

Planbureau, S. e. C. (2018). "De sociale steet van Nederland [The social status of the Netherlands]." from <https://digitaalscp.nl/ssn2018/wonen/>.

Pye, S. and e. al. (2015). Energy poverty and vulnerable consumers in the energy sector across the EU: analysis of policies and measures. *INSIGHT_E*.

Refabert, F. (2019). Criteria for a financing offer fit to energy-efficient home refurbishments. *One-Stop Shops in the EU: current and future role in building renovation*. P. Bertoldi. Brussels, Belgium.

Refabert, F. (2019). Webinar - Financing Home Renovation in Europe. *Sustainable Energy Investment Forums*.

Risholt, B. and T. Berker (2013). "Success for energy efficient renovation of dwellings—Learning from private homeowners." *Energy Policy* **61**: 1022-1030.

Rosenow, J., R. Platt and A. Demurtas (2014). "Fiscal impacts of energy efficiency programmes—The example of solid wall insulation investment in the UK." *Energy Policy* **74**: 610-620.

Rousselot, M. (2018). Energy Efficiency Trends in Buildings. Brussels, Belgium, Odyssee-MURE.

- Saheb, Y. (2016). Energy Transition of the EU Building - Unleashing the 4th Industrial Revolution in Europe. Brussels. Brussels, Belgium, OpenEx.
- Saheb, Y. and H. Ossenbrink (2015). Securing Energy Efficiency to Secure the Energy Union: How Energy Efficiency meets the EU Climate and Energy Goals. Ispra, Italy, European Commission, Joint Research Center.
- Schäfer, M., M. Jaeger-Erben and S. Bamberg (2012). "Life Events as Windows of Opportunity for Changing Towards Sustainable Consumption Patterns?" *Journal of Consumer Policy* **35**(1): 65-84.
- Schneider, C. Q. and C. Wagemann (2012). *Set-theoretic methods for the social sciences: A guide to qualitative comparative analysis*. Cambridge University Press.
- Scott, M. G. and e. al. (2016). "Evaluating the impact of energy interventions: home audits vs. community events." *Energy Efficiency* **9**(6): 1221-1240.
- Shah, A. K., S. Mullainathan and E. Shafir (2012). "Some consequences of having too little." *Science* **338.6107**: 682-685.
- Sharma, D. and R. Molloy (1999). *The truth about customer solutions*. New York, NY, USA, Booz Allen & Hamilton.
- Slywotzky, A. J. (1996). *Value Migration: How to Think Several Moves Ahead of the Competition*. Boston, MA, USA, Harvard Business Review Press.
- Smil, V. (2016). "Examining energy transitions: A dozen insights based on performance." *Energy Research & Social Science* **22**: 194-197.
- Sovacool, B. K. (2016). "How long will it take? Conceptualizing the temporal dynamics of energy transitions." *Energy Research & Social Science* **13**: 202-215.
- Stephenson, J., B. Barton, G. Carrington, D. Gnoth, R. Lawson and P. Thorsnes (2010). "Energy cultures: A framework for understanding energy behaviours." *Energy Policy* **38**(10): 6120-6129.
- Teece, D. J. (2010). "Business Models, Business Strategy and Innovation." *Long Range Planning* **43**(2): 172-194.
- Transition Zero (2018). Report on structural finance product for social housing.
- Vandewiele, D., D. Cuypers, M. Kremling and I. Van de Vyver (2016). Deliverable D2.3. Success and fail factors of organising demand, Refurb project.
- Wilson, C., L. Crane and G. Chrysochoidis (2014). Why do homeowners renovate energy efficiently? Contrasting perspectives and implications for policy. London, UK, Tyndall Center for Climate Change Research.
- Wilson, C., L. Crane and G. Chrysochoidis (2015). "Why do homeowners renovate energy efficiently? Contrasting perspectives and implications for policy." *Energy Research and Social Science* **7**: 12-22.
- Zancanella, P., P. Bertoldi and B. Boza-Kiss (2018). Energy efficiency, the value of buildings and the payment default risk. Ispra, Italy.
- ZEBRA2020 project (2016). Energy efficiency trends in buildings.

List of abbreviations and definitions

EASME	Executive Agency for Small and Medium-sized Enterprises
EC	European Commission
EE	Energy Efficiency
EnPC	Energy Performance Certification
EPC	Energy Performance Certificates
EPBD	Energy Performance of Building Directive
ESCOs	Energy Service Companies
ESI	Swiss Economic Sustainability Indicator
EU	European Union
GHG	greenhouse gas
IEA	International Energy Agency
INNOVATE	H2020 project, http://www.financingbuildingrenovation.eu/
JRC	Joint Research Centre of the European Commission
KPI	Key Performance Indicators
kWh	kilowatt-hour
m ²	square meter
Mtoe	million tonne oil equivalent
nZEB	nearly-zero energy building
OSS	One-stop shop
RICS	Royal Institution of Chartered Surveyors
WEO	World Energy Outlook

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Annexes

Annex 1. Methodology

The descriptions and analysis in this report were kick-started based on a JRC study carried out in January 2018 to collect case studies of OSS. The OSS registry was published in the JRC **report** ([Boza-Kiss and Bertoldi 2018](#)).

Further OSS were identified with a snowball sampling exercise (See more on methodology in Chapter **Error! Reference source not found.**).

In the first report 23 case studies were presented. During 2019 further case studies were collected and added to the registry, making up **a list of close to 70 examples**. Their overview is included in the current report in Annex II. After the publication of the first report, project owners connected with us via email, phone and as presenters or participants at the **workshop titled “One-Stop Shops in the EU: status current and future role in building renovation”** organised in Brussels in March 2019 by the European Commission Joint Research Centre. Later in the summer of 2019, more case studies were added using a snow-ball technique for identifying as many examples as possible. In this snow-ball sampling exercise experts and the already known OSS were asked to point to other similar businesses. The geographical focus was placed on the EU, and examples from outside of the EU were included on the basis of European and/or sector specific (residential buildings) reference to the current study (e.g. the “Energy Savers Programme” in Chicago, the USA due to its close focus on residential buildings). The data collection was recapped via an email-based survey specifically focused on questions related to costs and policies in collaboration with the project INNOVATE⁶⁰.

Further information was collected from document analysis, and interviews (telephone, email, and personal at the workshop), as well as from regular conference calls with relevant H2020 projects (for example INNOVATE). Finally, clarification interviews were conducted with 24 OSS representatives in January 2019, during the Workshop in March 2019, and following-up the email survey in autumn 2019. The information was coded, then analysed qualitatively and quantitatively.

For this research the descriptive case study methodology ([Harrison, Birks et al. 2017](#)) and Qualitative Comparative Analysis (QCA) ([Schneider and Wagemann 2012](#)) were used. As such, pre-defined descriptive data have been collected for all of case studies. The information to be collected was based on previous research projects, such as the Eracobuild⁶¹ and Refurb⁶², and streamlined by the research team.

Annex 2. Case studies registry

⁶⁰ <http://www.financingbuildingrenovation.eu/>

⁶¹ <http://www.one-stop-shop.org/node/21>

⁶² <http://www.go-refurb.eu/>

The following table summarizes the basic features of each OSS.

Table 21. Overview of the “one-stop shops” demonstrated in the report.

Title	Geographical coverage	Timing	Conceptual basis	Central element	Role implementation	in Financing	Social responsibility
RenoBooster	Vienna, Austria	Planned (Set up within a H2020 project for 42 months)	Focused on advisory and financing service for home renovation.	Simplifies the renovation for the homeowners by bundling the various services and information in a central contact point.	General energy efficiency/refurbishment advices, plus technical implementation of refurbishment.	No information.	First 5 years expected to achieve 5.5. GWh/a primary energy savings and 1000t CO ₂ savings.
HomeGrade	Brussels Capital Region, Belgium	2019 - (operational)	Focused on financial advice, advice on selection of quotes.	Energy or other cost savings (EPC type), focused on private or mixed multiapartment houses.	Provides mainly tailored advices and energy analysis. Does not work on technical implementation and monitoring.	Starting from a soft loan, technical assistance in the form of OSS is added The source of financing used for the renovation projects resulting from the OSS service are Homeowner's own funds and credit, Earmarked budget, EPC solution.	Target also social housing.
RenoWatt	Started in Liege, extended to whole Walloon Region, Belgium	2014 - (operational)	Pilot started by a non-profit organization (GRE-Liège), aim at achieving energy renovation of public buildings.	Service funded by national government.	Provides technical implementation of refurbishment.	Mainly bank loans – EPC is applied for the energy savings guarantee but not for the financing part.	It aims at obtaining energy savings and CO ₂ emission reductions. It expects a consistent

Title	Geographical coverage	Timing	Conceptual basis	Central element	Role implementation	in Financing	Social responsibility
							mobilization of direct and indirect jobs.
CLEAR	Belgium, Italy, Spain, Portugal and The Netherlands	2014 - (operational)	Group procurement to lower costs, combined with a set of other elements to increase trust.	Actively guides consumers in through all the stages leading to the purchase of Renewable Energy Systems for self-generation of electricity and heat.	None. Main role is in selection and purchase.	Not central.	Promotion of RES and checking quality through tests.
Huisdokter	Limburg city, Belgium	2005 - (operational)	Focuses on awareness raising, full value chain (tailored advice in the home but also self-calculation available), identification of the measures to do, and doing at home, building plan advice	Initiated by a consortium (construction professionals, local authority, private persons) Aims to help meetings between homeowners and local stakeholders (banks, construction companies)	None. Main role is in awareness and advice.	EPC	No
Vlaams Energiebedrijf	Flanders region, Belgium	2015 - (operational)	It provides various financial and technical support programs. It has limited types of measures and solutions.	Consortium (KAW, municipalities, National Government, Ten Hag Makelaars). Project based (no packages).	Provides help in the stages of advice, planning, organisation, and monitoring. Not clear if it provides technical implementation.	It helps mixing the available subsidies and financial support. EPC.	No
Rhodoshop Programme	6 municipalities from the Rhodope Region,	September 2017 -	To assist governments by centrally procuring on	Central procurement and bundling suitable	None.	Connecting clients with banks and ESCOs if	Follows the Public Procurement

Title	Geographical coverage	Timing	Conceptual basis	Central element	Role in implementation	Financing	Social responsibility
Development Unit	Bulgaria	August 2020	behalf of local authorities to undertake energy retrofitting works in their buildings and street lighting systems.	projects.		needed.	principles.
EEE Consortium	Sofia, Bulgaria	2005 - (operational)	Based on the found 'Energy Efficiency and Renewable Sources Fund' (EERSF), formerly known as the 'Bulgarian Energy Efficiency Fund' (BEEF) Focus on financing and advising.	The Fund assists clients in developing energy efficiency and RES projects and provides their financing or co-financing or acts as guarantor towards other financing institutions or commercial lenders.	The services comprise three parts: - Lending - Credit guarantee facility - Technical assistance provision.	As of 2014 there were 17 active ESCOs with which EERSF had collaboration agreements, and 4 financial institutions and has general framework agreements for joint operation with 5 other financial institutions.	CO ₂ reductions.
Aradippou Municipality One-Stop-Shop	Municipality of Aradippou, Larnaca District, Cyprus	Planned (Pilot within a H2020 project (INNOVATE))	Starting from a soft loan for RES, the municipality wants to extend the technical and informational support to citizens.	Financial tool to blend municipal grants with loans, for single private residential homes.	None. Main roles are in assistance, advice, organization, and follow-up.	Financing instruments used for paying for the renovation promoted by the OSS are National grant and Market-based loans.	Promotion of RES.
Litoměřice	Litoměřice city, Czech Republic	Planned (Pilot within a H2020 project	Municipal spin-off to help single private residential homeowners to decrease building	The municipality or a spin-off will provide personalized advice, support along the renovation project,	None. Assistance limited to advice, feasibility studies, financing plan, and training of craftsmen.	Existing local subsidy for boilers and solar water heaters. Advice for reaping other sources. Financial	No

Title	Geographical coverage	Timing	Conceptual basis	Central element	Role in implementation	Financing	Social responsibility
		(INNOVATE))	related energy consumption.	monitoring afterwards for 5 years. An online kit will be available for self-monitoring. Partners will provide financial advice and building inspection.		instruments used are National and EU grants.	
Bauteam Hamburg	Hamburg city, Germany	n/a	n/a	n/a	n/a	n/a	n/a
Energiesprong Germany	Germany	2017-2020 (operational)	To support renovation and new building solution of single private residential homes, with focus on efficiency and technologies.	Ministry of Energy in Germany (BMWI) allocated budget to fund market development.	n/a	Renovation costs are largely refinanced from the saved heating and maintenance costs, supplemented by funding.	Support deep renovation, with energy efficient refurbishments.
Frederikshavn OSS	Frederikshavn Municipality, Denmark	Planned	To help homeowners of single private residential homes, to participate to dialogue meetings and create engagement and responsiveness.	Free advice is financed from the Public Service Obligations (PSO) scheme (utilities' free of charge advisory scheme in Denmark). It is a charge that homeowners pay through their electricity bills.	It is foreseen assistance in all stages.	The budget of the Horizon project Innovate covers the costs for promoting and launching of the OSS-services. For the renovation projects Homeowner's credit (mortgage, personal loan, etc.) is used.	It is based on a political and social goal of deep decarbonization or locally to become 100% RES dependent in Frederickshavn by 2030.
CLEAN Green Business Growth	4 cities, Denmark,	Ceased	Provided to homeowners holistic planning and following implementation by contractors (advisors,	Contractors develop personalized plan The Authority does not provide the full value chain services, only	Yes. Assistance in almost all early stages, except financing plans and monitoring	n/a	no

Title	Geographical coverage	Timing	Conceptual basis	Central element	Role in implementation	Financing	Social responsibility
			craftsmen, etc.), which are trained by the Authorities	mediates and raises general awareness. Clinet has to select from a list of contractors, which might or might not offer an integrated home energy renovation. (there is no certification)			
BedreBolig (BB) (Better Housing) initiative	Denmark	2013 - (operational)	Provides holistic councelling to homeowners by contractors (advisors, craftsmen, etc.), which prepare a Better Housing Plan for the homeowners and assists them to go through the renovation process.	Focused on single private and condominium. Danish Energy Agency provides access, but the contractors act as OSS (as full service providers).	It provides assistance in almost all early stages (advice, energy analysis, feasibility study), and on technical implementation.	Financing instruments typically used for paying for the renovation that is promoted by the OSS are preferential loan, energy efficiency obligations and white certificates.	No
BetterHome	Denmark	2014 - (operational)	Based on the products of the four founders, offers organised renovation to improve energy performance and indoor climate, using standardised packages.	Three standardised packages and local contractors that have been trained and quality assured.	Full implementation with the mediation by local contractors, except financing provision.	The customer discusses the renovation project with his/her usual bank, and the bank can use the BetterHome tool to refer to the details. The associated banks trust the BetterHome quality and financial characteristics.	It focuses also on social housing renovation.
CleanTech	Denmark	n/a, probably closed	Promotion and wider marketing of the product of the mother	An extension of the manufacturing business. Local contractors are in	Full implementation with the mediation by	Possible assistance with the application for national renovation	No

Title	Geographical coverage	Timing	Conceptual basis	Central element	Role in implementation	Financing	Social responsibility
			company in cooperation with partners.	touch with the customer and install the given products. Service quality guarantee based on training and tools for contractors.	local contractors.	subsidy and offers financing solutions.	
ProjektLavenergi	South Denmark, mainly Kolding	n/a, probably closed	Promotion and wider marketing of the product of the mother company. The holistic renovation is based on the concept of external air tightening and insulation of the house.	Builds energy performance improvements on any kind of home renovation. Provides training and mentoring to local craftsmen.	Full implementation with the mediation by local contractors.	Assistance in financing.	No
Sustain Solutions	Denmark	2015 – (operational)	Holistic solution for renovations that is supported from the Funds resources and the investments are recovered from the utility cost savings.	It aims to make the renovation process simpler and achieve higher energy efficiency improvement levels.	The partner, Smith Innovation provides the experts for the renovations.	PKA provides the capital.	Focus on sustainable projects (wind-farms, energy renovations), required by members.
KredEx	Estonia	2009 – (operational)	The aim is to support the national energy, climate and building targets.	The core of KredEx is the offers of grants and loan schemes, which are combined with technical assistance in documentation and in implementation.	None.	The core of the service is financing.	n/a
OSS-Ex	Extremadura Region, Spain	Planned (to be)	4 EE measures (can be considered as	AGENEX (Energy Agency of Extremadura)	None. It provides technical advice, deep	It will offer a possible combination of loans	No

Title	Geographical coverage	Timing	Conceptual basis	Central element	Role in implementation	Financing	Social responsibility
		launched at the end of 2019 or early 2020, part of a H2020 project (INNOVATE))	packages). The intervention has to include a minimum of two of the four energy efficiency measures. general and specific advice provided.	involves a set of expertises, which comprehend architect or engineer, marketing, IT specialist, economist figures.	energy audit, private procurement, evaluation and combination of financing alternatives, monitoring, guaranteed savings.	and financial sources, such as regional grants and national loans combined with loans from commercial banks that are supported by technical assistance and through the Extremadura Guarantee Fund.	
OpenGela	Bilbao and Eibar, and will go up to all the Basque Country, Spain	Planned (March 2020)	Program to raise citizen engagement, and to provide innovative financing for vulnerable populations.	The idea is to bring together public administration with private players/invertors. A Social Guarantee Fund will be created for vulnerable people who face the housing renovation, and need a de-risking solution for the financing.	Assistance in all stages, including implementation.	The source of financing of the renovation projects are Public budget, Loan provided by GNE financing (Social Guarantee Fund), Market based loans and Tax relief.	The project has been designed to improve conditions in vulnerable districts.
HolaDomus	Started in the city of Olot, Catalonia, Spain. With a capacity to expand to region of Catalonia. Spain	Planned (As a pilot within a H2020 project (INNOVATE))	To provide administrative support: management of available subsidies/grants, work permits, and any other bureaucratic steps linked to the Municipality with the goal of simplifying and speeding up the	Focus on single private residential homes and private or mixed multiapartment houses.	Assistance in all stages, but no implementation per se.	Home-based financing provided by GNE Finance. For vulnerable groups, GNE Finance has put together a Social Guarantee Fund. It foresees specific discounts on local taxes.	At national level, it move towards the transposition of EPBD, and the application of Spanish climate law (Ley General de Cambio Climático), aiming to make the Spanish

Title	Geographical coverage	Timing	Conceptual basis	Central element	Role implementation	in Financing	Social responsibility	
			process.				economy carbon neutral by 2050.	
ENRA concept	Finland	Ceased (closed 2010)	in	A group of companies offering different individual energy renovation services or solutions in a holistic package.	Acts as project manager (but no information whether single-point of contact).	No information.	Help obtain approvals from local authorities and apply for subsidies.	No
SEM Ile-de-France Energie (formerly Energies POSIT'IF)	Ile-de-France Region, France	2013-(operational)		To help private or mixed multiapartment houses homeowners with administrative and bureaucratic support to organise projects to achieve high energy performance.	The core activities are feasibility studies and energy analysis, together with technical management and organization of implementation.	Assistance in most stages, including implementation. Single point of contact.	The source of financing used for the renovation projects resulting from the OSS service are homeowner's own funds and credit, Local budget, Public budget. Instead for the renovation promoted by the OSS are National grant, Market based loans, Tax credit and relief, Energy efficiency obligation and EPC.	No
ARTEE (Agence Régionale pour les Travaux d'Economies d'Energie)	Nouvelle-Aquitaine Region, France	n/a		To assist single private residential homes and private or mixed multiapartment houses homeowners with administrative support for buildings renewals.	Main activities focus on the early stages of the implementation of the projects (advice, financing plan, etc.).	Not clear if it participates on implementation.	Various sources for the projects, which includes public and local budget, and homeowner's own found and credit. For the renovations relies on, besides tax credits and EPC, on supranational grants,	n/a

Title	Geographical coverage	Timing	Conceptual basis		Central element	Role implementation	in	Financing	Social responsibility
							and market-based or preferential loans.		
Picardie Pass Rénovation (Régie Régionale du Service Public de l'Efficacité Energétique)	Picardie Région (individual houses) / Hauts-De-France Region (condominiums), France	2013- (operational)	To pilot ambitious renovation projects with holistic assistance.		Combines various initiatives to improve conditions.	Assistance in all stages, including implementation.	Arranges third-party financing (EPC), combined with White Certificates and grants.	Not clear	
Oktave	Alsace Champagne-Ardenne Lorraine region (France)	2017 – (operational)	Aims to boost the rate of energy renovations.		Personalized support on technical, financial and administrative aspects of the renovation project and are the primary and only contact point for the renovation project.	Single-point of contact.	Helps to develop financing plan, combine grants, tax rebates, and commercial loans (arranges zero-interest loans), or third-parties/ESCOs.	n/a	
Bordeaux Métropole Energies (BME)	Bordeaux Region, France	Operational (n/a start date)	n/a		n/a	n/a	n/a	n/a	
AREC Occitanie	Occitanie Region, Spain	Operational (n/a start date)	n/a		n/a	n/a	n/a	n/a	
Région Centre-Val de Loire OSS	Val de Loire Region, France	Operational (n/a start date)	n/a		n/a	n/a	n/a	n/a	
Région Normandie	Normandie	Operational	n/a		n/a	n/a	n/a	n/a	

Title	Geographical coverage	Timing	Conceptual basis	Central element	Role implementation	in Financing	Social responsibility
OSS	Region, France	(n/a date)					
Brest Métropole OSS	Brest Region, France	Operational (n/a start date)	n/a	n/a	n/a	n/a	n/a
Espace-Info Energie	Toulouse Metropole, France	Operational (n/a start date)	Provides financial advice and renovation technical advice for single, condominiums, and social housing.	Based on an associative company whose goal is to accelerate energy transition and agroecology through unbiased counselling and follow-up of research, studies, formation programs and other initiatives. Solagro is the center of the association: an advisory company (consultant) works together with City of Toulouse, ADEME, SPIRE financing, etc.	None. Focus is on tailored advice.	The financing instrument used for paying for the renovation promoted by the OSS is SPIRE. It is a national loan scheme run by Regional Agency for Climate and Environment (AREC).	Has a strong focus on fuel poverty. It works towards GHG emission reduction and water consumption.
Energiesprong France	Several locations, France	2016 – (operational)	Service of consultancy towards sustainability in buildings.	It provide also for deep renovation (super energy efficient refurbishments) and new built solutions.	n/a	The financing instrument used for paying for the renovation is the Caisse des Dépôts, a French semi-public financial institution that plays a major role	n/a

Title	Geographical coverage	Timing	Conceptual basis	Central element	Role implementation	in Financing	Social responsibility
						in financing social housing, energy transition & smart city developments in France.	
RenoHUB	Hungary	Planned (Pilot in a H2020 project, started in November 2019)	Structure not fully known well, but it should provide online advisory and physical shops.	Target buildings are single and condominium.	Not clear. It claims to have a full value chain, including social, behavioral, communication and capacity building and ex-post assessment of energy savings.	n/a	No
Projekt Doktor	Hungary	Operational (n/a start date)	It targets complex and integrated renovation of private condominiums (but private single buildings may also be covered).	It promotes network with subcontractors.	Consultancy based, it covers most phases of the chain including feasibility study, financial plan and application (combination with national and local subsidies), full technical implementation with quality assurance and monitoring.	The service is paid directly by the homeowners and by National government.	No
Superhomes	Tipperary city, Ireland	2017 – (operational)	Support the retrofit of private houses.	n/a	n/a	n/a	n/a
Project Development Assistance for	Piemonte Region, Italy	Operational (n/a start	To provide development assistance to Local	Targets public buildings (office, education, hospital, sports, etc.).	None, mostly focused on consulting. In the tender documents it is	The Project Development Assistance (PDA) is	No

Title	Geographical coverage	Timing	Conceptual basis	Central element	Role in implementation	Financing	Social responsibility
Local Authorities in Piemonte		date)	Authorities aimed to obtain buildings energy savings.		also included a measurement and verification plan for checking the performance along with the management of the contract.	paid with project budget co-funded by EU. It uses EPC for financing renovation projects. For paying the renovations, besides EPC it is used the national grant.	
Center for Sustainability	Region of Parkstad, including the City of Heerlen, Netherlands	2014 – (operational) (Started in the scope of a H2020, continues to operate with local support)	Targets single private residential homes and private or mixed multiapartment houses with the service of consulting ad advice.	Store based, where personal advice can be gathered - no packages.	Assistance in all stages, including implementation.	The financing for the renovation projects is based on homeowner's funds and credit, together with local and public budget. The renovation per se is financed by national grant, market-based loans and EPC.	It tackle the topics of mitigating social erosion and fuel poverty
Reimarkt	Netherlands (currently 6 locations: Enschede, Delft, Den Bosch, Groningen, Zoetermeer, Hoogeveen)	2014 – 6 (operational)	Bundles the offers of small, local supplier, thus markets their offers and matches them with the retrofit needs. Shows information only relevant for the stage of decision-making road.	Builds energy performance improvements on any kind of home renovation, focusing on private residential buildings and social housing.	Single-point of contact.	The financing for the renovation projects is based on homeowner's funds and credit, together with local budget. The renovation per se is financed by market-based loans.	No
WoonWijzerWinkel Rotterdam	Rotterdam and other cities, Netherlands	Operational (n/a start	Gives financial plans and assistance to apply to the client.	Warehouse exhibition and store, where the clients can get acquainted with the	None. The focus is not on accompanying the client along the way, and the personalisation	n/a	No

Title	Geographical coverage	Timing	Conceptual basis	Central element	Role in implementation	Financing	Social responsibility
		date)		technologies and products. Personal advice and further assistance is available at the spot.	seems to focus on the kick-start.		
Haarlemse Huizenaanpak	Haarlem, the Netherlands	2014 – (operational)	Tailored renovation package for residential homeowners and every type of home.	Builds energy performance improvements on any kind of home renovation.	The client can choose the OSS or other contractor to implement the plan.	n/a	Locally responsible, respect towards architecture.
Stroomversnelling (previously Energiesprong)	Several locations, Netherlands	2013 – (operational)	To promote house refurbishments.	Independent, market development organisation that helps market players cooperate and achieve zero-energy level renovations.	Yes, they manage the whole process cooperating with local contractors.	New financing is organised for the renovation.	Net Zero Energy refurbishments.
Slim Wonen in Leeuwarden	Leeuwarden region, Netherlands	2013 – (operational)	To provide tailored provision of information using a customer management system, to carry out renovation of buildings.	Personalised advice.	This is more a mediation (even though the companies are trained and branded by the OSS).	n/a	No
Bolig Enøk	Østfold, Akershus and south east of Oslo, Norway	2011 – (operational)	Homeowners employ a “Project Manager”, who provides technical analysis, recommendations and project management of the full renovation process.	The project manager is the single-point of contact.	The company seems to work as an advisor/facilitator rather than a holistic service provider.	Assistance in applying for relevant grants.	No

Title	Geographical coverage	Timing	Conceptual basis	Central element	Role in implementation	Financing	Social responsibility
Vaxjo OSS (no name yet)	Kronoberg (region), Vaxjo, Sweden	Pilot Not continued. It was part of the H2020 project (INNOVATE)	To provide advice and assistance for building renovation.	Targets single private residential homes.	Yes, assistance in all stages, except training of craftsmen.	Energy advice is free of cost financed by Swedish government. The renovation projects are financed by homeowner's funds and credit.	n/a
EBRD credit lines	Various places, Slovakia, Bulgaria	eg MunSEFF (2010-2015), SlovSEFF (2007-2012), REECL (2006-2015)	The aim is to improve energy performance of the building stocks of the target countries.	The credit lines are often combined with technical assistance, online technical tools, and support for policy dialogue.	None.	The core of the service is financing.	n/a
Servicio de Información de Rehabilitación Eficiente (SIRE)	Spain	2019 - (operational)	Not clear.	Organisation: EMVS - Municipal Housing and Land Company - of Madrid in collaboration with ANERR - National Association of Rehabilitation and Reform Companies.	Office based, but combined with ReformANERR, an online service.	n/a	n/a
Zerohome Program	Sonderborg city, Denmark	2020 (unclear) - (operational)	n/a	n/a	n/a	n/a	n/a
Mantova OSS	Mantova City, Italy	Planned (pilot within a	n/a	n/a	n/a	n/a	n/a

Title	Geographical coverage	Timing	Conceptual basis	Central element	Role in implementation	Financing	Social responsibility
		H2020 project (INNOVATE))					
FinEERGo-Dom	Various country in Eastern Europe (PL, BG, SK, LV, RO, NL, AT)	pilot H2020 project starting in 2020	To help managing energy efficiency investments.	multi-stakeholder platform SHAREX. The main aim of the platform is to standardize the process of managing energy efficiency investment projects by managing the multiple stakeholders involved.	n/a	n/a	n/a
Retrofit Works	The UK	2013 – (operational)	Acts as an intermediary between SME suppliers and customers.	Ensures best service, transparency and value for money – quality assurance. Online audit -> 3 quotes.	Assistance in all stages, but no implementation per se.	Assistance in grant acquisition.	Special deals with fuel poor.
Ecofurb	London city, The UK	Planned (Started early 2020)	Give personalized advices, collecting informations and connecting homeowners and a large network of contractors.	Target on single private residential homes. Based on an online tool.	Assistance in most stages, including implementation.	The service is paid by the homeowner's own funds, as well the financing of the renovation projects. National grant is only available for renovation linked to heat pumps.	No
Allenergy's Affordable Warmth Service	Argyll & Bute region, Scotland, The UK	Operational (n/a start	To provide advice to households.	Single private residential homes Private or mixed	None. Assistance mainly in early stages of advice and feasibility studies.	The service is paid by the Local energy agency, for the	No

Title	Geographical coverage	Timing	Conceptual basis	Central element	Role in implementation	Financing	Social responsibility
		date)		multiapartment houses.		renovation projects are used local and public budget. National grant and EPC are used for the renovation per se.	
Tighean Innse Gall	Western Isles, The UK	Operational (n/a start date)	Locally situated agency that assists local citizens and businesses in all stages of a renovation projects.	Combines large variety of programmes from information, advice, monitoring, etc.	Yes, can undertake implementation.	Assists in financing and can add own resources.	Yes, focus on vulnerable citizens.
Renovation Underwriting	The UK	2020 - (operational)	Hybrid personal/commercial insurance contract specific for renovation.	n/a	n/a	The service is paid by the homeowner.	No
Energiesprong UK	The UK	2018 - (operational)	n/a	n/a	n/a	n/a	n/a

Annex 3. Email questionnaire

1) What is the name of the OSS that you will give information about?

2) Country/location of activity: where does the OSS work? (if the activity is focused on a city or region, please name it/them)

3) Which part of the value chain does the OSS provide?

For each line, tick one box.

	never	sometimes	mostly/always	I do not know/do not want to answer
general energy efficiency/ refurbishment advice				
specific (tailored) advice				
preliminary proposal/feasibility study				
building inspection/energy analysis				
financing plan				
technical implementation of refurbishment				
quality monitoring, technical management				
organisation of implementation, overseeing of works				
providing training(s) to craftsmen				
financing provision				
Monitoring				
follow-up, customer care				

	never	sometimes	mostly/ always	I do not know/do not want to answer
guarantee of achieved energy savings				
other (specify below)				

3/b) If you said other, what did you mean?

4) What clients does the OSS target?

Tick as many as apply.

- Single private residential homes
- Private or mixed multiapartment houses
- Social housing
- Mixed use buildings (residential and non-residential)
- Public buildings (office, education, hospital, sports, etc.)
- Private tertiary buildings (offices, hotels, retail, malls)
- Other, which is _____

5) What is the direct price the homeowner/customer pays for the service?

Please, provide an average price (in EUR/project), and explanation (which of the above services are included? what influences the price?)

6) What is the cost of the service (administrative, material, tools used or developed, etc.)?

Please, provide an estimate per project. If it has been changing over the years, please, indicate.

7) Who pays for the service?

Tick as many as apply.

- Charged to the homeowner directly (up-front or monthly)
- On-bill payment by the homeowner/building user
- Industry (e.g. material, building component producer or installer)
- Municipality, regional government (e.g. fund)
- National government (e.g. fund)
- Local energy agency
- National energy agency
- Other, which is _____

8) What is the source of financing used for the renovation project(s) resulting from the OSS service?

Tick as many as apply.

- Homeowner's own funds
- Financial sector: Homeowner's credit (mortgage, personal loan, etc.)
- Local budget (e.g. grant, loan, fund)
- Public budget (e.g. EU or national grant or loan, etc.)
- Earmarked budget (e.g. social or environmental)
- Energy performance contracting (EPC) solution
- Industrial stakeholders (e.g. material, building component producers, installers)
- Other, which is _____

9) What financing instruments are typically used for paying for the renovation that is promoted by the OSS?

Tick as many as apply.

- National grant
- EU grant
- Other supranational grant (World Bank, EIB, etc.)
- Market-based loan

- Preferential loan
- Energy or other cost savings (Energy Performance Contracting type)
- Tax credits
- Tax relief
- Energy Efficiency Obligations, White Certificates
- Other, which is _____

10) What policies (national, local, EU) concerning technical, financial, organisational, or legal aspects have helped the set-up and/or operation of the OSS?

11) What policies (national, local, EU) concerning technical, financial, organisational, or legal aspects have hindered the set-up and/or operation of the OSS?

12) What policies would you find helpful to support the OSS, in particular in reaching deep renovation and/or wide replication? Please indicate the level of jurisdiction (EU, national, local)?

13) Can we contact you for further information in order to collect more information for EU policy-making related to OSS?

- Yes
- No
- Other, which is _____

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