Deliverable 5.3
Report on replicability potential

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Revision: 1
Due date: 30/09/2019 (M24)
Submission date: 30/09/2019 (M24)
Lead contractor: RINA

Dissemination level		STUNNING
PU	Public	X
PP	Restricted to other program participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 768287.

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Deliverable Administration & Summary					STUNNING
Status	Final	**Due**	M 24	**Date**	30/09/2019
Author(s)	Enrico SCODITTI (RINA)				
Editor	Karine Laffont-Eloire (DOWEL)				
DoA	This document provides the analysis of the replicability potential of the identified Business Model. The analysis leverages on one hand on the identification of key factors of the real application of the promising Business Models identified in Task 5.1 within real business cases. On the other hand on the analysis of the most favorable countries at EU level, under market, economic and financial point of view. Last but not least, the geo-clustering approach has been also used to assess potential replicability across EU.				
Comments					

Document change history			STUNNING
V	**Date**	**Author(s)**	**Description**
1.	30/09/2018	Enrico SCODITTI	First version
1.	30/09/2018	Karine LAFFONT-ELOIRE	Second version

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EXECUTIVE SUMMARY

This report has been prepared in the framework of WP5 “Promotion of new business models and validation through business cases” of STUNNING project “SusTainable bUsiNess models for the deep renovation of bulIdiNGs” (GA: 768287).

The focus of this report is the analysis of the replicability of the most promising Business Models (BM) identified in Task 5.1, in the light of the insights drawn from Task 5.2, which identified and thoroughly studied a set of real application cases with a twofold purpose:

- on the one hand, to provide a clearer and more comprehensive understanding of BMs, enabling the identification of the key elements necessary to ensure their success, as well as their common features towards potential optimization.
- on the other hand, to identify those possible obstacles specific to the application contexts, which are difficult to foresee unless directly experienced

In summary, the activity carried out in task 5.1 led to the identification of five types of most promising business models in correspondence of the European area in which they are currently applied and they present the higher grade of replicability. Such promising models are:

- ***Enerphit*** - One Stop Shop Model based on Step-by-Step approach, based on retrofitting of existing building facilities with passive house components supported by an initial planning of the activities
- ***EPC plus*** – An Energy Supply Contracting (ESC) version, involving a cluster of SMEs, responsible of jointly supplying EE measures and RET services, and extending the service of the ESCO to comprehensive structural measures on the building shell like insulation or window replacement
- ***Energiesprong*** – Innovative application of OSS provided by multi-disciplinary team cooperation, which proposes a new financing and construction model, based on the idea to move from a product-centred approach to an industrialised, service-oriented approach that uses innovative technologies
- ***Betterhome*** – Innovative One Stop Shop Model based on ICT tools
- ***EUROPACE***– Among the “New financing schemes” Business Models, EUROPACE will develop, pilot and standardise the PACE financing scheme (on-tax financing mechanism) for residential energy efficiency retrofits

Afterwards, activities in task 5.2 focused on the research and collection of potential Business Cases (BC) to be selected considering both climate and building stock characterizations. The Business Cases identified have been deeply described, analysed and evaluated towards the development of distinctive elements as well as common features that could be translated into recommendations for the Business Model widespread adoption.

Building upon the results of these previous tasks, the present report is structured in three different steps.

The first part (Chapter 2) examines and deepens the work carried out in the course of the previous activities, thus identifying, for each business model, **the specific key elements**, essential to ensure their broad scale replicability.
It quickly emerged that the choice of focusing on geographical contexts (macro-climate areas) to assess the replicability of the different BMs was too generic, and that the replicability analysis should also consider other determining parameters which can strongly differ even between neighbouring countries.

Six countries were selected for the replicability analysis, namely**, Denmark, Italy, Spain, France, Germany and Poland.** They were chosen with a twofold reason. On the one hand, because they were estimated to

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present the most favorable countries for the BM replication, under market, economic and financial point of view (in other words, they represent key launching/ replicating markets for the studied business models). On the other hand, becouse they can cover a wide range of scenarios in terms of:

- Amount and type of incentives provided
- Dominant type of housing (single family houses, multi apartment buildings, etc.)
- Dominant type of ownership (owner-occupants, private tenants, social housing, etc.)
- Climate context

The second part (chapter 3) reports the results of the analysis carried out at country level, focusing on the replicability of the Business Models examined in chapter 2 and structured so as to present, for each country:

- A brief overview including the available elements useful to characterize its housing market. The elements taken into consideration were, for instance: composition of the existing building stock, the price growth rate of the Real Estate sector, the effects of energy renovations on the property value, the growth rate of investments in the real estate sector, the mortgage Loans Interest Rates, Energy costs, and all the elements useful to provide an overall view of the country (Property tax, Tenure split, Rent policies)
- A brief overview of the incentives in place to stimulate the implementation of EE measures in the existing building stock
- The main barriers, which emerged from the work carried out in the framework of Task 4.1 and from literature, and which limit the energy renovation process

The third and last part (Chapter 4) is specifically aimed at evaluating the BM replicability, by matching the BM key factors (**step 1**) and the main features of the selected countries (**step 2**). As a result, an array is attributed to each BM, where each key factor for replication has been qualitatively evaluated on a scale from 0 to 3, according to the likelihood for each country to meet such requirement.

The detailed analyses for each Business Model lead to the following assessments:

Step by Step approach/ Enerphit replicability

	Denmark	Italy	Spain	France	Germany	Poland
Combinability of different forms of incentive			X	XX	X	X
Incentives to encourage the adoption of multiple measures at once	X		X	X	X	XX
Low interest rates	XXX	XX	XX	XXX	XXX	X
Minimum household income	XXX	XX	XX	XXX	XXX	X
Heat metering in case of centralized system	XXX	XX		XXX	XXX	

EPC Plus replicability

	Denmark	Italy	Spain	France	Germany	Poland
Market segment (single houses or buildings with less than 10 dwellings)	XXX	XX	X	XXX	XX	XXX
Absence of regulatory barriers	X	X	X	X		

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Absence of structural barriers	X	X	X	X	X	
Absence of financial barriers	XX		X	XX	XX	
Presence of incentives, even if the investments are borne by ESCOs.		X	X	X		

Energiesprong replicability

	Denmark	Italy	Spain	France	Germany	Poland
Wide availability of single or multi-family buildings, with not overly complex geometries	XXX	X	XX	XX	XXX	XXX
Upward trend in real estate market prices	XX		XXX	X	XXX	XXX
High household income, compared to the cost of investment	XXX	XX	XX	XXX	XXX	X
Grants and tax incentives for this specific approach		X	X	X	X	X
Limited segmentation of the building stock	XX		X	X	XX	XX

BetterHome replicability

	Denmark	Italy	Spain	France	Germany	Poland
Structure the supply-side	XXX	XX	XX	XXX	XXX	X
Use digital solutions to bring added value to the end-users	XXX	XX	XX	XXX	XXX	XX
Build awareness for the end-users	XXX	XX	XX	XXX	XXX	XX
Safeguard the good reputation	XXX	XX	XX	XXX	XXX	XX
High energy costs	XXX	X	XX		XXX	
Limited segmentation of the building stock	XXX	X	X	X	X	X
Accessibility to low-interest loans	XXX	XX	XX	XXX	XXX	X

EUROPACE replicability

	Denmark	Italy	Spain	France	Germany	Poland
Legal and fiscal readiness	XXX	XX	XX	XX	XXX	X
Level of public indebtedness	XXX		X	X	XX	XX
Possibility for the owner to pass on the property tax to the tenant	XXX	X	XX	XX	XXX	XX

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In a nutshell, countries with the overall most favourable conditions for the replicability of the selected BM, are Germany and Denmark, as they are characterized by high energy costs, wide accessibility of financing and higher disposable income housing. Among the selected models, the one presenting the greatest possibilities of replication across the EU countries is the Stop Shop based on a step by step approach (as in Enerphit), which has the advantage of reducing the initial investment to the minimum. EPC plus is the model that is the most difficult to replicate, mainly because of the difficulty for SMEs to access the necessary financing.

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1. Background and methodology

1.1. Project background

40 to 45% of Europe's energy consumption comes from buildings with a further 5-10% required for the manufacturing and transport of construction products and components. As such, the building sector is one of the key enablers for achieving 2050 low carbon economy goals. Only 1 to 2% of the building stock is replaced annually in the EU[1], hence most of the energy savings required to meet Europe 2050 goals must come from existing buildings. However, **today's measured rate of refurbishment (1.2%) is much lower than the one which should be observed to remain in line with Europe 2050 ambitions**. There is a need to accelerate the market uptake and large-scale implementation of energy efficient refurbishment solutions and increase the renovation level to 2-3% per year until 2030. This ambition is reflected in several European regulations and roadmaps, such as the Energy Performance of Building Directive (EPBD), the Energy Efficiency Directive, the SET-Plan (Action 5) and the recent Energy Union Winter Package.

In addition to this, the European building sector is still highly fragmented and not yet able to offer holistic solutions for existing buildings' deep renovation at acceptable cost and quality. The building process usually involves multiple separated disciplines and players, which leads to additional costs and risk of failure[2]: integration is critical. **Additionally, the renovation market is principally supply-driven, which can lead to a mismatch between the offered products and the end users' needs.** Nevertheless, a number of non-technical stakeholders also influences decision making in building renovation. Municipalities, local authorities and local energy/building renovation agencies are for example instrumental in the achievement of the EU renovation targets, especially when addressing the optimal integration of RES[3], which requires planning, and implementation at a district scale. There is a need to increase awareness of commitment to improved energy-efficiency of the building stock, and to increase the capacity of municipalities to promote and assist the renovation of building stocks, in particular through the use of public procurement tools.

In this context, STUNNING project has been funded by the European Commission within the HORIZON 2020 framework programme (call EEB-08-2017 "New business models for energy-efficient buildings through adaptable refurbishment solutions"). STUNNING overarching goal is that of "engaging with the whole community of stakeholders and accelerating the adoption of new business models for energy-efficient buildings based on integrated, adaptable and affordable refurbishment packages, which will contribute to reaching the targeted EU renovation rate".

Indeed, with the involvement of a comprehensive stakeholders community (including industrials and SMEs from the construction sector, energy utilities, capital providers, municipalities, building owners, tenants, research institutes), STUNNING aims to accelerate the adoption and large scale replication of new business models delivering adaptable and affordable refurbishment solutions, in order to meet the building renovation rate set by the upgraded EPBD. Under the coordination of DOWEL, five players (CSTB, RINA, Solintel and Steinbeis 2i GmbH, all key active members within the ECTP) propose a systemic and integrated approach to address the market rollout of innovative refurbishment packages, supported by an Advisory Board covering

[1] Boosting Building Renovation: What Potential and Value for Europe? – Study for the ITREE Committee – 2016 - Directorate General For Internal Policies Policy Department A: Economic And Scientific Policy

[2] EASME (2016) Energy Efficiency – Building Renovation Challenge: Practical Approaches

[3] RES: Renewabvle Energy Sources

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the whole refurbishment value chain. The five project objectives are aligned with all the EEB-08-2017 call challenges:

- Supporting the cooperation of diverse, yet dispersed, stakeholders federated in a single stakeholder community built around a web-based knowledge sharing platform addressing technologies and business models for refurbishment in EU28;
- Benchmarking and (geo)clustering innovative refurbishment packages and ranking them according to profitability / energy efficiency indicators;
- Identifying and addressing barriers which still prevent these refurbishment packages from being replicated by value chain players;
- Promoting and validating (through real business cases) novel renovation business models allowing consumers and the market to invest with confidence, thanks to performance-guaranteed energy savings, and addressing end user's commitment to energy efficiency after renovation;
- Disseminating the support action outputs, with an exploitation strategy for the newly built knowledge-sharing platform, thus continuing to interact with the stakeholders' community beyond the completion of the STUNNING project and contributing to maximising its impact and more globally the EEB PPP[4].

1.2. Approach towards the replicability of business models identified

In the framework of the STUNNING project, the following analysis have been carried out:

- Assessment and identification of the **main stakeholders of construction sector** with the aim of identifying their main needs and their role in the delivery of the specific renovation packages (both in the delivering of the technical solutions and in the implementation of the related business models);
- Evaluation of the **renovation packages** in order to evaluate the most relevant KPIs[5] and cost-benefits associated to them as well as the main building type for them to be put in practice in a cost effective way, also according to the country of application;
- Identification of **potential success stories** implementing promising refurbishment packages.

Based on this review, the following steps were set up and carried on towards the promotion of new business models:

1. **Identification and evaluation of innovative business models for dedicated key stakeholders**, with a two-fold aim. On one hand, that of creating a dedicated Business Models' (BM) DataBase (DB) to stimulate the collection of additional data and eventually to find potentially uncovered business cases and target markets, to define BMs clusters, and eventual data filling needs, etc. On the other hand, to select a limited number of basic criteria to be measured, giving the possibility to identify replicable and adaptable models of business, representative of the typical needs into the refurbishment activities.
2. **Application of selected business models within real case studies** that have been selected covering different built environment.
3. **Promotion of the selected and validated business models** further analysed in order to find the most promising driving features for their wide scale replicability across Europe.

[4] Energy Efficiency Buildings Public Private Partnership

[5] Key Performance Indicators

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The focus of Deliverable 5.1 was the description of the methodology defined for performing Step 1 and the related main output in terms of Business Models' DataBase set up, business model clustering, definition of specific criteria for selecting the most promising business models, etc.

Deliverable 5.2 focused on Step 2, mainly devoted to the Business Cases identification, description and evaluation in order to extract common key features in terms of recommendations, BM optimization, potential strategies towards replication, etc.

Step 3 activities have been reported in the present document.

The first part of this report (Chapter 2) focuses on the identification of the driving features at the basis of the efficiency of refurbishment activities, as well as the potential key success factors enabling the replicability of the Business Models identified and tested through Business Cases.

The second part (Chapter **Erreur ! Source du renvoi introuvable.**) addresses the analysis of the geographical context where to evaluate the replicability of the BMs. In order to circumscribe the scope of the study a limited number of countries (6) has been identified based on specific criteria (Climatic context, Dominant type of housing, Dominant type of ownership, Financial and economic conditions) As a result, the analysis of the selected countries highlighted the key factors that can influence the refurbishment of the house-building stock and, more specifically, the replicability of the most promising business cases analyzed in D5.2.

The key factors considered were mainly grouped in 2 main categories:

- The **social, economic and financial factors**, related to the state of the Real Estate market of the context analysed. They include for example the composition of the existing building stock, the price growth rate of the Real Estate sector and, the effects of refurbishments on the property value, the growth rate of investments in the real estate sector, the mortgage Loans Interest Rates, Energy costs, and all the elements useful to provide an overall view of the situation (Property tax, Tenure split, Rent policies)
- **Factors linked to the policies** adopted by each country to encourage the energy renovation of existing buildings, including incentives and policies adopted to foster energy requalification

Nevertheless, also the barriers hindering the implementation of EE measures in existing buildings have been considered in the analysis.

Finally, on the basis of BM analysis performed in Chapter 2 (providing the key factors for replication) and on the analysis of the most representative EU countries (leveraging on the identified categories of indicators) provided in Chapter 3, the replicability analysis has been performed. When available, data from the geo-clustering tool[6] has been included as well to validate the match between BM and geographical context.

[6] GE2O: Geo-clustering to deploy the potential of energy efficient buildings across EU (http://e2b.ectp.org/project-database-list/project-details/geo-clustering-to-deploy-the-potential-of-energy-efficient-buildings-across-eu/)

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2. Business models: Key factors for successful replication

This section aims to evaluate the most promising business models identified within deliverable D5.1 “Report on the scenario identified”, this time in the light of the experience provided by the business cases analyzed in detail in deliverable D5.2 “Case studies results”, which were meant to highlight, in their specific application context, limits and requirements pertaining to the specific models.

Table 2.1: Most promising BMs identified in D5.1.

Most promising business models	Geographical most favorable context	Dominant type of housing in these countries	Dominant type of ownership in these countries
Betterhome	Denmark, Finland, Sweden, Norway	Highly dependent on country (Norway: SFH, Sweden: apartments)	Owner occupied (>75%)
Europhit **EPC plus** **EUROPACE**	Cyprus, Greece, Italy, Malta, Portugal, Spain	Highly dependent on country (Greece: SFH, Spain: apartments)	Owner occupied (>70%)
Energiesprong **Remourban**	Austria, Belgium, France, Germany, Ireland, Luxembourg, Netherlands, UK	Highly dependent on country (Ireland: SFH, Austria: mix of both)	Owner occupied (60-75%) Private rented (10-20%) Public rented (5 to 25%)
Enerphit **EPC plus**	Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia	Highly dependent on country (Slovenia: SFH, Latvia: apartments)	Owner occupied (>75%)

The brief description of the most promising models, reported in Table 2.1, is followed by a description of the key factors identified to ensure their replicability. In addiction, where it has been possible to examine in detail the Business Cases of the specific selected BMs, their analysis has been further deepened to extrapolate any conditions and constraints, that could have been ignored or underestimated from the BM’s analysis.

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2.1. One Stop Shop based on a step by step approach: Enerphit innovative BM

2.1.1. Description

The Enerphit Business Model belongs to the group of the One-Stop-Shop business models and aims at refurbishing the building through a step-by-step approach.

The model is based on the planning of the sequential replacement of the individual existing elements of the building, scheduled at the end of their useful life. Preliminary to the start of the first investments, a certification scheme for step-by-step retrofit with Passive House components has to be established. The focus of the scheme was on the creation of an EnerPHit Retrofit Plan (ERP) for all energy refurbishment measures, to be implemented independently over a given period of time. Only through this approach a satisfying result be achieved for stepwise retrofit projects.

The EnerPHit Retrofit Plan (ERP) is a document for building owners, including well-thought-out overall concept for stepwise retrofits and taking into account important interrelations between different energy saving measures permitting to obtain an optimal final result with manageable effort. The ERP can be submitted to a Passive House certifier, who will check the coherence of the described step-by-step process and the fulfilment of the criteria. This gives the building owner the guarantee that the EnerPHit Standard will be met if all steps are carried out as described.

The ERP can be certified after the first step of renovation has been completed and verified by the certifier. In the subsequent years, the client confirms all other steps with the certifier. Changes to the original concept are possible if the requirements can still be met, in order to respond to specific needs of the building owner, for example, or to implement novel solutions. In any case, any change should be clarified with the certifier, in order to agree on the solution and check the renovation measures will fulfill the criteria to obtain the Enerphit Standard certification.

The main advantage is for the owner to spread the costs of interventions over a longer period of time.

2.1.2. Results from business cases

D5.2 describes three applications of this model, each one representative of a different climatic context and a different type of building:

- **Typical detached villa, Stockholm, Sweden**

  It is a typical concrete-block detached villa on two floors from the 1950's, where the private owners intended to renovate their property over a long period of time, with the aim of achieving high energy performance and the certification of the results that will be achieved.

  During the first step, the building owner in collaboration with the designer (Passive House Institute of Sweden) has planned the investment of those elements deemed essential in order to restore the habitability of the apartment on the ground floor. In summary, it has therefore proposed the renovation of the floor of the ground floor, which included the thermal insulation and the installation of a radon gas barrier, as well as the insulation of the walls. The installation of solar collectors was also planned, to reduce the impact of district heating costs to a minimum.

  70% of the investment 44.000€, was funded by the European Commission, within the EuroPhit

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Project. In addiction there was a Tax-reduction scheme called ROT-avdrag,which is done yearly and therefore step-by-step had an additional benefit since the reduction can be applied over several years (tax-reduction up to 50 000 SEK/year on work carried out at the building by professional craftsmen).

- **Large residential building (multi-family) in Treviana Social Housing, Madrid, Spain**

  This BC is about a large residential building (multi-family) with 14 floors and 72 apartments built in 1963 in Madrid, Spain. It belongs to multiple owners and Spanish regulation requires that the renovation has to be approved by a minimum of 60% of the owners. New owners of a building apartment proposed the first retrofitting step. They decided to retrofit only the apartment before the community took the decision to realize other interventions. To date, only the first of the planned interventions has been carried out, at a total cost of 13726 €.

  The most interesting aspect introduced in the project is the methodology, specifically developed to take into account the future sequential intervention, which prevents the two interventions from being mutually exclusive.

- **"St. Kiril and Methodius" Primary School building, Gabrovo, Bulgaria**

  It is the refurbishment process, performed in steps, of a public school building. The aim is both to reduce energy consumption and to improve air quality and therefore indoor comfort. The investment amounted to a total of 1.2 M€ and, as in the two previous cases, was financed up to 70% by the European Commission.

2.1.3. Key factors for replication

The step-by-step approach is probably the most likely to be replicated as it minimises the main obstacle to the process of energy renovation of buildings, i.e. the high initial investment. It is the approach that is most suitable for small investors with a prudent attitude, who aim to improve their living conditions and who do not immediately seek a significant increase in property value.

The main advantage lies in the possibility to check, after each intervention, the benefits in terms of comfort and energy savings, splitting the risk between smaller investments, as well as keeping the possibility to make corrections in the course of future interventions.

The important elements for the success of this business model are:

- **Technical know-how of the consultants who advise clients.**

  Even in the most ordinary cases, it should be kept in mind that the interventions carried out in the early stages will have to be compatible with the interventions planned in the future, possibly avoiding unnecessary redundancies, and therefore the allocation of costs in interventions that will not generate savings.

  An example of possible inconsistency between sequential interventions could be the application of an insulated layer on the inner side of a perimeter masonry, which is followed years later by the replacement of the windows to reduce infiltration, and thus bring condensation and mold. In order to avoid this risk, the application of air-permeable insulation materials has to be considered from the very beginning.

  An example of redundancy could be the application of an insulating layer on the inside of a perimeter masonry, followed by the application of an insulating system on the outside of the

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entire building. In this case the first intervention would be substantially useless.

- **High percentage of apartments occupied by owners**

  Statistically, homeowners are more likely to carry out improvement works.

- **Cumulation of incentives over time**

  In order not to depress the interventions after the first one, it is essential that the incentives accrued during the various interventions are compatible and cumulative.

- **Acceptable level of income and possibility to take advantage of incentives provided as tax deduction**

  As highlighted by studies aimed at finding out the main factor behind consumer choices regarding investments in energy efficiency and renewable energy technologies (Amelia & Brandt, 2015) the level of income is one of the parameters most closely related to the probability of investing in energy efficiency (Figure 2.1). Obviously, it has to be weighed against the cost of living, energy and, above all, the average cost of investment.

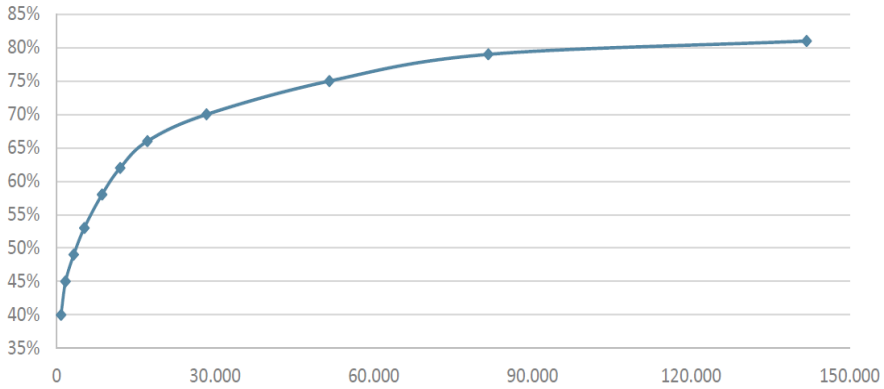

Figure 2.1: Predicted probability of investing in energy efficiency at different income levels, 2015 (%) (Amelia & Brandt, 2015)

To ensure the success of this approach, given that investments are reduced and spread over long periods, it seems to be more driven by low levels of poverty and unemployment than, for example, by just the economic growth (GPD). While approaches involving more important investments rely on the growth in demand and therefore on the greater disposable income of households in this case a balanced distribution of wealth could therefore be preponderant.

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2.2. EPC plus

2.2.1. Description

The EPC plus BM is one of the business models based on Product Service Systems (PSS) involving Energy Service Companies (ESCOs). In this particular sub-category, instead of an ESCO, A SPIN (SME Partnerships for Innovative Energy Services) is in charge of carrying on the work. Indeed, the SPIN is an organized cluster of independent companies, mainly SME's, that jointly supply energy efficiency services and that have a structured long-term collaboration with commonly agreed objectives.

The SPIN, in return for its services, receives a performance-based remuneration in relation to the savings it achieves. Generally, savings achieved can only be measured indirectly as difference between consumption before and after implementation of the EE and RE measures (relative measurement: savings = baseline - ex post-consumption).

The standard scope of services encompasses the entire building, and may also include the installation of renewable energy production systems. However, since EPC models run under long-term contracts of typically ten years, only the most cost-effective efficiency measures are usually included (i.e.: HVAC, lighting, controls and building fabric improvements).

The EPC plus business model, on the other hand, extends the service of the SPIN to comprehensive structural measures on the building shell like insulation or window replacement, which are usually excluded from the classical EPC because of excessively long pay-back periods. The contractual arrangement contains special regulation on financing. Usually the customer has to pay a share of the investment through a grant or by combination of EPC with subsidy programs. EPC plus is very suitable in buildings with high need for renovation. The combination of both structural renovation (EE) and energetic optimization (RET) leads to high energy savings up to 50%.

2.2.2. Results from business cases

D5.2 describes two applications of this model based on Energy Supply Contracting (ESC), both of them in southern Europe and both of them involving an ESCO instead of a SPIN. Although they are not application cases of the specific proposed model, but rather of the macro category to which it belongs, it has been nevertheless considered worthwhile to include them in the analysis in order to provide indications that, by analogy, could also be extended to the EPC plus.

- **Multi property residential buildings, Torrelago district, Laguna de Duero, Spain**

  This BC consists of the renovation of Torrelago district, involving 31 private multi-property residential buildings (1488 dwellings), built in the 1970s–1980s, characterized by very low conditions in terms of both efficiency and comfort.

  The interventions were concentrated both on envelope and systems, through the creation of a smart network of district heating.

  Again, the owners have repaid the intervention in the form of montly fees paid according to energy savings. The intervention costed on average 52,480 €/flat, with a return period of 30 years.

- **Social Housing Apartments, Pieria, Greece**

  This BC consists of Social Housing Apartments, located in the North of Greece, built in two different periods, between 1977 and 1981.

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This case study had the credit of investigating the possibilities for energy efficient retrofitting for low incomes and social housing by using the possibilities of energy performance contracting (EPC). After a first phase where heat meters were installed, allowing the individual apartments to be autonomous and thus gathering information on consumption for each individual apartment, a second phase followed in under which the energy efficiency measures were actually implemented, namely the replacement of the existing boilers, the insulation of the pipes, the installation of external roof insulation, and the paintings of the blocks externally with paints with high solar reflectance. The ESCO, Techem took over the energy management of the blocks and borne the financing and the execution of the works at its own expense. At the end of the works, the contract stated that the occupants would pay Techem a fixed fee to cover the expenses incurred for the investments, and a variable fee that also depended on the registered consumption, in order to encourage a cautious use of energy.

2.2.3. Key factors for replication

The main advantage of this specific Business Model, and more in general of all the models based on Product Service Systems (PSS), is that they overcome the main obstacle that limits energy refurbishments in case of multi-family buildings, namely the high initial investment costs

Particularly interesting is the Greek case that "splits" the investment in two steps. The first step involves the installation of heat meters for each apartment, implementing the logic by which everyone pays according to their consumption, even in the case of central heating. This has a twofold preparatory effect to the second step of the actual redevelopment:

- It induces behavior that is more conscientious and an initial reduction in consumption, which is no longer distributed among all condominiums according to the surface area of the apartments.
- It allows an initial monitoring of occupants' habits, reducing the risks arising from a possible overestimation of energy savings

In light of the business cases analyzed, the important elements in order to ensure the success of this business model are:

- **Presence of regulations encouraging, if not even imposing, the heat metering** in condominiums with centralized systems.
- **High energy consumption and costs**, also as a result of policies that discourage energy consumption
- **Share of occupant-owner**
- **Regulatory flexibility**, allowing the application of the mechanism also in the case of tenant occupied apartments
- **Presence of incentives, in the form of subsidies**, even if the investments are borne by ESCOs.
- **Low interest rates**

With respect to the traditional ESCO market segment, namely condominium apartments with more than 10 apartments (as also shown within the Business Case), EPC plus, being a consortium of small and medium enterprises, with related problems in obtaining financing and/or holding major investments with internal resources, necessarily can only aim at smaller buildings, namely: **single houses or small condominiums**

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2.3. Energiesprong

2.3.1. Description

In brief, it is a One-Stop-Shop BM provided by multi-disciplinary team with complementary competences, such as architects and designers, constructors, energy-efficiency experts, market and financial experts, technology suppliers, strategy and operations planners.

Compared to other business models belonging to this category, the Energiesprong approach proposes a new financing and construction model. The idea is to move towards an industrialized approach, aimed at reducing refurbishment costs. The essential condition is the preliminary segmentation of the market finalized to the identification of standard solutions.

Because Remourban adopts a similar approach to Enegiesprong, where the OSS is provided by the particular case of Private-Public-Partnership, which also targets the same market segment, its analysis will be omitted, believing that the validity of the result of the analysis on the replicability concerning energiesprong can be ex, tended also to Remourban. Coherently, the remourban application case will be exploited hereafter to provide further indications for Energiesprong

2.3.2. Results from business cases

In D5.2, two different BCs, one in Southern Europe and one in Western Europe, have been identified where Energiesprong Business Model has been applied

- **Social housing apartments and district single family houses, Nottingham, United Kingdom**

  This BC consists of ten homes consisting of both single-family and multi-family houses, and aged between1900 to the 70s. A large number of the properties (65%) in the area are social housing, owned by Nottingham City Council (public owner) and managed on their behalf by Nottingham City Homes.

  The case study is mainly characterized by the support of a wide network of professional multi-disciplinary team of experts which has resulted in:

  - Optimal control of the total costs in an early phase of the project
  - Optimal integration of different measures

  Nevertheless, the most interesting aspect is related the financial mechanism. The household payed an ‘Energy plan’, and the landlord (NCH) received an on-going income to fund similar works to more homes. The resident had a much more comfortable home, and a flat rate cost for energy, which will not rise significantly when energy bills rise.

- **Typical brick individual house, Hem, France**

  This BC consists of 10, typical northern brick individual houses (2 groups of 4 houses and 1 group of 2 houses) in Hem, owned by the social housing association Vilogia.

  The requalification was characterized by a highly industrialized process. It resulted in a minimization of the time required for the work, which lasted only 3 weeks per building, to a total of only 3 months.

  As the process adopted is still at the prototype stage, the costs were well above the average costs for this type of intervention (1525 €/m²).

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2.3.3. Key factors for replication

The key to success for the replicability of this business model is **the correct identification of the market segment to focus on**. As seen for the case of Hem, in France, the implementation of industrial process systems, while on the one hand has the following potential advantages:

- **Longer useful life of the refurbishment intervention compared to a traditional intervention** (i.e.: a facade coating intervention has an average useful life of only 20 years)
- **Potentially high impact on the property's value**, following the restoration of conditions, also aesthetic, equivalent to a newly constructed building
- **High quality construction**, less likelihood of errors due to skill level of the workers involved.

On the other hand, this comes at the expense of investment costs which, even though in the Netherlands have dropped, from the first pilot of 2010 to date, from 130.000€ to 65.000€[7] [8]per unit for a terraced, are still high. It is clear that such an approach can be chosen mainly by investors interested in real estate operations involving the revaluation of the real estate value of the renovated building.

For this to be possible, it is necessary that:

- A **wide availability of single or multi-family buildings**, characterized by not overly complex geometries, in a state of decay.
- A **stable upward trend in real estate market prices** that can drive this type of investment. Otherwise, the early conditions for upward trend in investment and real estate market prices, which are ideal for real estate development operations, should occur (low levels of unemployment, rising salaries, population growth, also through migration flows)
- **High GDP per capita**, ensuring the existence of a demand segment capable of dealing with major investments and/or high disposable income in households
- **Low private debt**, in order to make it financially sustainable for private individuals to purchase refurbished apartments at significant costs
- **Grants and tax incentives** that can support this approach in areas with lower incomes, such as the BC in Nottingham.
- **Limited segmentation of the building stock** in order to be able to deliver standardized solutions

[7] BPIE, i24c Memo November 2016, Think Deep: Boosting Renovation Through Innovation & Industrialisation: http://bpie.eu/wp-content/uploads/2016/11/I24C_MemoFinal.pdf

[8] it. The goal is to get the costs down to about EUR 40,000 per unit – European Construction sector observatory - Policy measure fact sheet – Netherlands – Energiesprong. March 2017

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2.4. Betterhome

2.4.1. Description

From the analysis reported in the D5.2, Betterhome was found to be the most promising business model and most likely to be replicated in other countries of Northern Europe. It belongs to the “One-Stop-Shop” business model and aims at providing full service energy efficient renovation of mainly private single-family houses (even though multi-family houses can also be addressed) and it is particularly widespread in Denmark countries where there is plenty of these buildings’ types.

Betterhome offers, basically free of charge (both for the owner of the building to be renovated and for the contractors involved in the redevelopment) a service that goes from the initial advice up to the tailor-made solutions based on his/her specific preferences, covering energy improvements on the building envelope and heating, cooling, ventilation and hot water systems inside the building.

The benefit for Betterhome is that its owners, suppliers of equipment and materials specific to thermal insulation, can profit from the supply chain generated by the stimulation of the interventions of energy requalification. An essential prerequisite is the initial intention of the owners of the individual houses to renovate the property, who are referred to Betterhome directly from the bank where they apply for the loan to carry out the work. The bank's profit is the result of the relationship of trust with Betterhome, to whom recognizes the ability to lead the customer towards the most optimal solution, and consequently less risky for the bank, which can therefore provide credit at better rates.

2.4.2. Key factors for replication

BetterHome is an industry-driven one-stop-shop model, which has proven successful in boosting demand for holistic energy renovations in Denmark, since the model was launched in 2014. It was profitable after just three years, with 200 projects in 2016 and is expected to continue its growth. Understanding that renovating a building is a big commitment, this model creates a burden-free experience for the building owner and offers a service that goes beyond replacing building components.

The home-owner-centric renovation journey has two main mechanisms: structuring the process for the installers and increasing building owners’ awareness. While the central aspects of the renovation journey are replicable on most European markets, the model must be adapted to the local context. Applying a similar model in other countries will require a greater focus on **quality assurance** and an **integration of financial support into the model**. In Denmark, quality assurance is heavily regulated, including guarantees for the building owners. A more comprehensive quality and compliance scheme is required on most of the other European markets. Furthermore, the available financial subsidy scheme for energy renovations in Denmark is modest and rarely decisive for the building owners’ decision to invest. In countries with substantial public support schemes for energy renovations, this can be incorporated into the business model.

The following key factors for replication can be summarized:

- **Structure the supply-side**

  The success of the home-owner-centric business model can be explained by the advanced service-oriented role of the installers. BetterHome trains and guides the installers on how to approach the home-owner, from the first contact to the finalisation of the process. In support, BetterHome also simplifies and structures the renovation process for the installer, through

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supportive and innovative digital tools, enabling a better evolution for all involved.

- **Use digital solutions to bring added value to the end-users**

  BetterHome shows that digital solutions can help the construction industry become more consumer-centric and service oriented. Moreover, with the use of innovative digital tools, building professionals can provide a smoother process, for themselves and for the building owner. Aligning with existing stakeholders on the market, including banks and mortgage providers, creates a constructive win-win situation.

- **Build awareness for the end-users**

  Training the installers in order to sell the broader picture, including benefits (e.g. low interest rates, increase in property value, improvements to health of their children and comfort, as well as climate and environmental benefits). The installer is not just replacing the old building elements, but creating a better living environment.

- **Safeguard the good reputation**

  This is indispensable. In Denmark, the four companies behind BetterHome are highly respected and associated with quality. Through the cooperation in BetterHome, the companies have worked together to also raise the reputation of the installers.

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2.5. EUROPACE

2.5.1. Description

EUROPACE is an Horizon 2020 EU funded project started in March 2018 that will develop, pilot and standardise the PACE financing scheme (on-tax financing mechanism) for residential energy efficiency retrofits in European cities. On-tax financing is a type of financing mechanism used to collect the repayment for money that was lent for investments in building improvements that meet a 'valid public purpose', e.g. save or produce energy. EUROPACE is a form of on-tax financing and it builds upon an existing relationship municipalities have with their citizens – the property tax system. Within three years the project intends to Assess Market Readiness in EU, conducting market review to determine viability and attractiveness of EUROPACE financing across Europe.

The **city of Olot, Spain is currently developing an EUROPACE pilot** focusing on residential buildings. Several European cities, including Bilbao, Frankfurt, Kassel, Ladornac, Lisbon, Macerata, Pisa, Porto, Prague, and Toledo, have already expressed their interest in EUROPACE. Finally, the project will create a Toolkit, in order to facilitate the replicability of the approach and to scale it over EU countries.

The overall financing mechanism can be schematized as it follows:

- 100% up-front financing
- Long-term financing, up to 20 years
- Can be combined with utility, local, regional, and state incentive programs
- Financing is attached to the property – can be transferred to a new owner upon sale
- Financing is repaid with regular property taxes

2.5.2. Key factors for replication

The innovative character of the EUROPACE mechanism is that financing through EUROPACE is linked to the taxes paid on a property. In other words, the financing lent by a private investor is repaid through property taxes and other charges related to the buildings. The EUROPACE mechanism engages several stakeholders in the process: local government, investors, equipment installers, and homeowners. To establish the EUROPACE programme, several conditions must be satisfied, each of which are relevant for different stakeholder at different stages of the implementation.

In the framework of the EUROPACE Project an in depth analysis[9] to assess the legal and fiscal readiness for the adoption of an on-tax financing mechanism across EU28 was developed. The main key factors are hereby reported.

The important elements for the success of this business model are:

- **Suitability of the legal framework for on-tax financing**

  As EUROPACE is added to property taxes, the suitability of the legal framework is important an important factor to consider to assess the on-tax financing mechanism replicability. Property taxes differ in many aspects between countries, (RAEL, 2009) (Aedes, 2011)but issues such as

[9] https://www.europace2020.eu/project-deliverables

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the existence of a property-related tax, the regular collection of property taxes, or a relatively low level of exceptions in the tax collection mechanism are essential for the legal implementation of this business model.

- **Municipal capacity to develop an on-tax financing mechanism and municipalities' experience and policy objectives concerning EE and/or climate mitigation**

  Municipalities play a vital role in the EUROPACE business model, as they have an interest in implementing EE solutions and are also relevant actors in the creation of private-public partnerships (PPPs).

  The experience of municipalities in working on comparable assignments and to estimate their readiness to implement EUROPACE, can be assessed referring mainly to municipalities' capacities to manage EE projects, particularly in a PPP model.

  According to the best practices from PACE implementation in the US, a key indicator for replicability is a case where the municipality has experience working with the private sector to implement broadly defined investment programmes. Another key indicator for replicability is the existence of EE programmes and policies in buildings

- **Enforceability of local taxes and/or property taxes and assessment of charges, defaults, and delinquencies**

  The enforceability of local taxes and/or property taxes and an assessment of charges, defaults, and delinquencies assesses as well the roles and responsibilities of the local authorities that provide guarantees (including senior liens) to investors. In particular, this replicability indicator focuses on the progress made towards fair, standardised, and transparent administrative processes as well as possible penalties, tax liens, and, eventually, foreclosure procedures in cases of the non-payment of taxes. A fully developed guarantee mechanism over the payment of property taxes is considered as a key enabler.

- **Political, institutional, and social perceptions and acceptance of EUROPACE**

  It is difficult to compare the attitude towards property taxes, as these vary significantly among the countries analysed. There is a vast set of secondary country-specific data on the impact local taxes have on elections and on local and national debate in general. While in some countries politicians barely mention the importance of local taxes, in other, increases in local taxes lead to mass protests and can determine the results of local (or central, if the government is fully in charge of local taxation) elections. In principle, it can be concluded that the more stable and institutionally continuous the tax is, the easier it will be to use it as a basis for EUROPACE implementation.

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3. Analysis of geographical context towards BM replicability

As highlighted in paragraph 1.2, in order to circumscribe the scope of the study a limited number of country, six, has been selected with a twofold reason. On the one hand, because believed to be the most favorable countries for the BM replication, under market, economic and financial point of view. On the other hand, since they can cover a wide range of scenarios in terms of:

- Amount and type of incentives
- Dominant type of housing
- Dominant type of Occupants
- Climate context

The identification of the most promising countries was carried out on the basis of the following Key Indicators, being nevertheless careful to cover all the macro climatic areas of the European context:

- GDP and GDP per capita,
- Total residential floor area available, with particular reference to floor area built before 1979, more likely to need energy refurbishment interventions
- Real estate market dynamics and expectations for the following years.

These parameters allowed to identify those countries that can play the preponderant role to speed up the process of the existing building stock retrofitting, and therefore enabling a greater impact on the BM replicability.

Figure 3.1: GDP and total available residential floor area by county. GDP (Source Eurostat) is shown on the abscissae while the bubble diameter provides an indication of the total residential area built before 1979 (BPIE 2011 and EU Building Stock Observatory)

Coherently, Figure 3.1 classifies, for each macro climate zone, the countries of the European Union according to their GDP and the residential area built before the 1980s, which is the ideal target for energy-efficient interventions available.

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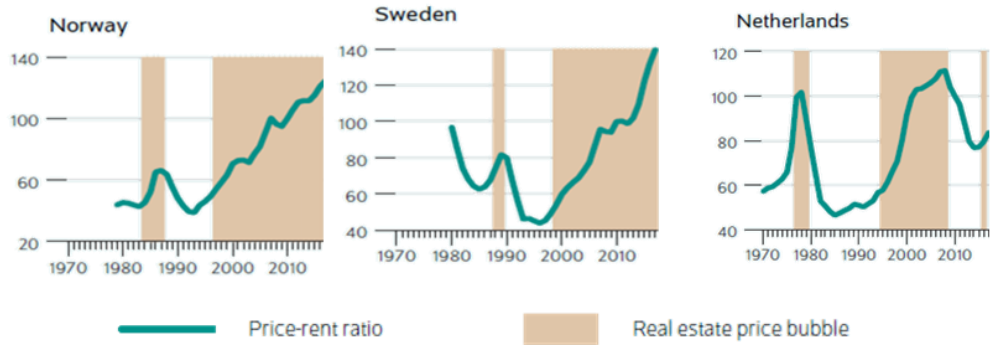

Figure 3.2: Housing price bubbles in Norway, Sweden and Netherlands – K. A. Kholodilin and C. Michelsenbased's calculation based on data from the Organisation for Economic Cooperation and Development (OECD).

Since **Germany, France, Italy and Spain** represent the first four economies of the European Union, it is natural to identify these countries as representative of their respective macro-climatic zones. As far as Eastern Europe, the choice fell on **Poland**, characterized by a GDP that is more than double of any other country belonging to the same climatic context and by a larger residential area. In Northern Europe Sweden and Norway are the countries characterized by the highest GDP. Nevertheless, both countries have a high risk of housing price bubbles (DIW Weekly Report 30+31 - Deutsches Institut für Wirtschaftsforschung e. V.). This could be indicative of the fact that the cyclical process of the building stock retrofitting, ongoing in recent years at growth rates well above the EU average, is about to come to a halt. Therefore, **Denmark** is the country chosen as representative of this macro-area. The same reason can be found in the choice not considering the Netherlands, even though it is the fifth largest economy in the EU.

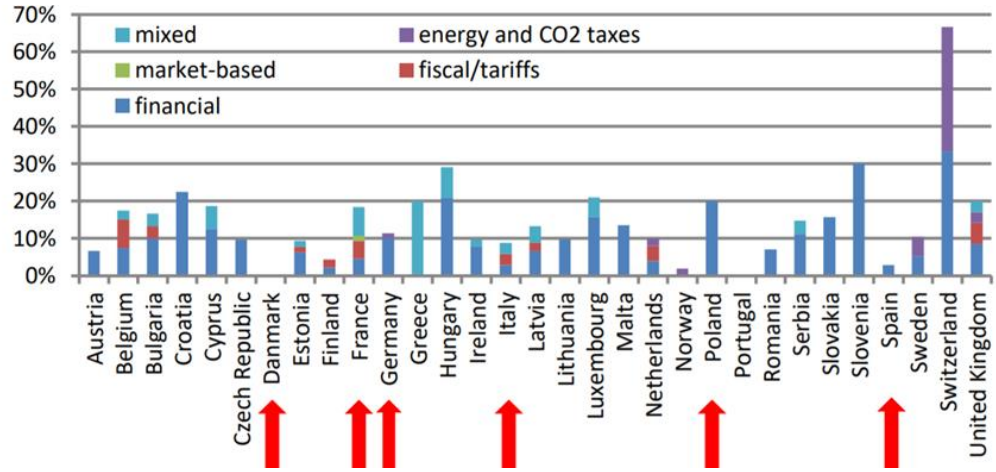

Figure 3.3: Financial, fiscal-tariffs, market based and taxation measures by country in households and services sectors (%)(source MURE[10])

[10] MURE (Mesures d'Utilisation Rationnelle de l'Energie) – Database providing information on energy efficiency policies and measures that have been carried out in the Member States of the European Union - http://www.odyssee-mure.eu/

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The 6 countries identified also provide the opportunity to analyse different approaches in terms of incentives and policies in support of energy refurbishments (Figure 3.3), from the mix of different measures in France, to the almost total absence of incentives in Denmark, to the widespread use of non-repayable funding in Poland. This can be extended to cover the different building typologies (Figure 3.4) and the different type of Occupants (Figure 4.2)

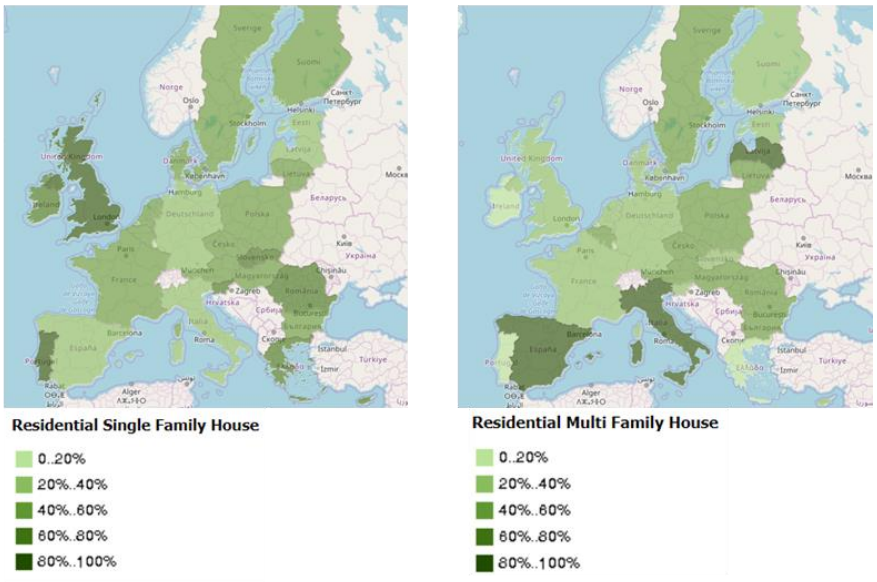

Figure 3.4: Building distribution by typology, across EU countries. Single and Multi-Family houses (source: EeB-CA2 Mapping Tool)

Hereafter, a general picture of the selected countries is provided in paragraph below. After the analysis of the housing market, main policies and incentives are briefly described. The main barriers hindering the implementation of EE measures in existing buildings are listed at the end of each paragraph.

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3.1. Denmark

- **Housing market in brief**

As in Sweden, after the financial liberalization of the 1980s, which led to a high cash flow to Real Estate, house prices more than doubled between 1995 and 2008

The global crisis of 2008 caused the first major correction in house prices, which dropped in a very short time by more than 30%, and then picked up again from 2012, up to 19%.

While in Denmark, therefore, house prices have remained in line with their fundamentals, suggesting that here, real estate growth, accompanied by gradual deleveraging of households, appears sustainable. The same cannot be said for Sweden, and therefore cautiously excluded from the selected countries. Here, the ongoing fiscal incentives that have encouraged households to save in housing equity, pension scheme and real estate fund, as well as the persistence of Non-amortized mortgage loans, combined with the eternal congenital shortage of supply, now entails the high risk of approaching a housing bubble (Gaál, 2017).

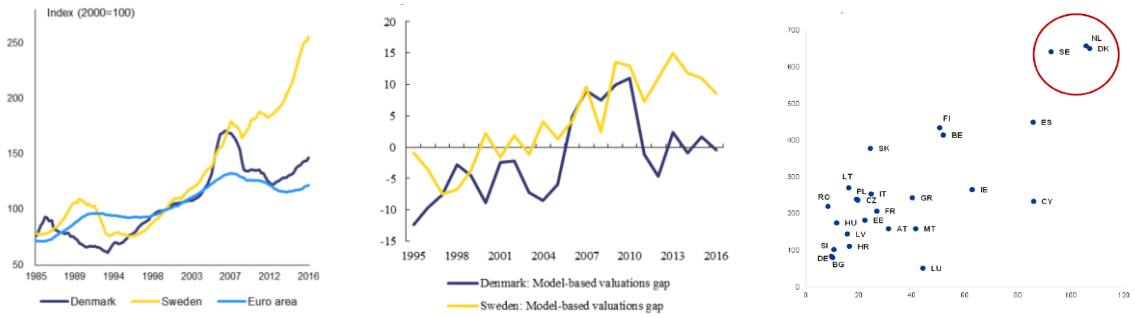

Figure 3.5: From the left: Real house price increase – Model based "valuation gap" with respect to the main fundamentals – Banks exposures to Real Estate (Gaál, 2017) (EU; percentages; 2018)

Peculiar features of the Danish context are:

- High proportion of rental dwellings, reaching approximately 40% of the total stock.

  It is therefore essential to understand what interest property owners may have in investing in EE measures, in the case of rented apartments

  With the exception of houses built after 1991, rents of apartments in Denmark are mostly subject to forms of control and capping of prices. The system is based on the idea that landlords must not be allowed to profit from renters. Landlords are only allowed to pass on costs, property taxes excepted, incurred in the day-to-day operation of the property, and a prescribed charge to cover maintenance costs. However, there are exceptions. Even in the most controlled rental regimes (Properties with at least 7 tenancies situated in a so-called regulated municipality), in the event that the apartments have been substantially improved at the landlord's expense, rents may be set at the rent level applicable for similar properties A dwelling is normally considered to have been substantially improved if the landlord has spent more than roughly EUR 31,000 in total or

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EUR 265 pr. sq. meter on the improvements[11].

- Lending conditions

  Danish financial institutions have been able to provide homeowners with large amounts of mortgage loans at the lowest rates in Europe. The key to this was Mortgage-backed bonds (or 'covered bonds'). In Denmark, the banking sector comprises two main actors: traditional banks and specialized mortgage institutions. Mortgage institutions do not receive deposits from the public, but finance lending through the issuance of mortgage bonds. Most of the credit granted to the household sector is channeled through mortgages: Mortgage bonds are bought by other financial institutions (notably pension funds) for their investment portfolios and liquidity management. Another important element has been the tax incentives, which encouraged the accumulation of householding debt. However, in recent years the Danish authorities, in order to limit the risks arising from over-indebtedness and a rise in house prices, have gradually reduced the deductible share of mortgage interest and tightened the requirements for obtaining financing (in particular on variable and interest-only loans), reintroducing the link between the property tax and the value of properties. Despite the mitigation process, the financial mechanisms in place have had the merit of overcoming one of the main limits to investments in EE measures, namely the lack of financial liquidity.

- Competitiveness in the construction sector

  One limit to the development of the Real Estate market, which therefore slows down the implementation of energy efficiency measures, is related to the low level of competitiveness in the construction sector, due to high regulatory barriers that make it difficult for foreign European construction services providers to enter the market [12].

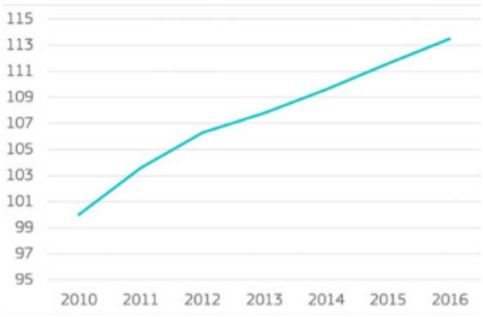

Figure 3.6: Construction cost index for residential buildings (Eurostat; 2017)

- Price paid by the market for energy efficiency

  there is evidence that the Danish real estate market pays a premium for energy refurbishments. For example, in the case of a 100 m^2 house with a C-label rating compared to a D-label rating house it was found, that it capitalized into a willingness for the house-owner to pay a premium price of EUR 6,000for the higher rated house.

- Energy costs

  With regard to consumption, electricity and gas prices, strongly conditioned by taxes and levies,

[11] Real Estate Investmens in Denmark, Gorrissen Federspiel

[12] European Construction Sector Observatory. Country profile Denmark

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are among the highest in Europe. In case of Multi-family building with centralized system, a minimum of 40% of the total heating costs (including heating of hot water) must be allocated according to individual meters. If only the space heating is considered, a minimum of 60% must be allocated according to individual heat meters or heat cost allocators.

- Property tax

  Owners of Danish real estate are generally obliged to pay property taxes, which are determined in each municipality and vary from 1.6 to 3.4%. For investment properties it is possible, and typical, to pass on the actual obligation to the tenant in the property lease agreement whereby a regulation of the rent payment will take place if the property tax rate is changed.

- **Policies and incentives**

  In Denmark, the task of financing the energy upgrading of the building stock is assigned to households, who have access to mortgage financing at highly convenient rates and conditions. There is not a single widespread, prevalent mechanism for financing energy requalification measures, but a strategy that includes a number of different initiatives, tailored to different goals and market segments [13].Some examples are:

✓ The Upgrading of the energy-labelling scheme, aimed at improving the correlation between real estate value and energy class
✓ The National Building Fund, targeted for energy efficiency renovation of social housing
✓ The BoligJobordningen initiative, in order to incentivize household to carry out energy renovation works, allows beneficiaries to a deduction of around EUR 1,600 per year for labour services for selected energy improvements.

- **Drivers and barriers**

The main barriers identified are (Lindseth, 2015; Niels Y. Meyer, 2014):

✓ Lack of awareness: many homeowners are not aware of the differences between the various degrees of refurbishment, therefore tend to choose for the most economic and strictly necessary solution

✓ Lack of trust in the construction and ESCO industry and more in general, in the promised outcome of the projects, especially in case of technical complexity of buildings.

✓ Long payback period of the alternatives

✓ Lack of will to borrow money for energy refurbishment

✓ Doubt about the financial advantages of energy refurbishment

With respect to other EU countries, energy prices, among the highest in Europe, due to the large share of taxes and levies, are seen as a relevant barrier.

Main driver to implement EE measures is the current economic situation with low interest rates.

[13] Concerted Action EPBD 2015-2018 – Denmark. Status at December 2016

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3.2. Italy

- **Housing market in brief**

Finally, after almost a decade in which the Italian real estate market has struggled to return to the levels before the financial crisis, both in terms of prices and investments, the housing market is recovering gradually. Demand is now rising and residential construction activity is increasing, mainly supported by extraordinary maintenance investments. The market outlook is improving (pwc, 2018).

The upward trend in prices and investments in the real estate sector is driven by the growth in disposable income, which has risen slightly since 2014 and has finally returned to pre-crisis levels in the last two years. An indicator correlating current market trends and household disposable income is the Affordability Index (calculated by combining Interest rate, Housing prices and Disposable income, as shown in Figure 3.7), which indicates to what extent the average resident is able to purchase a house at the average market price.

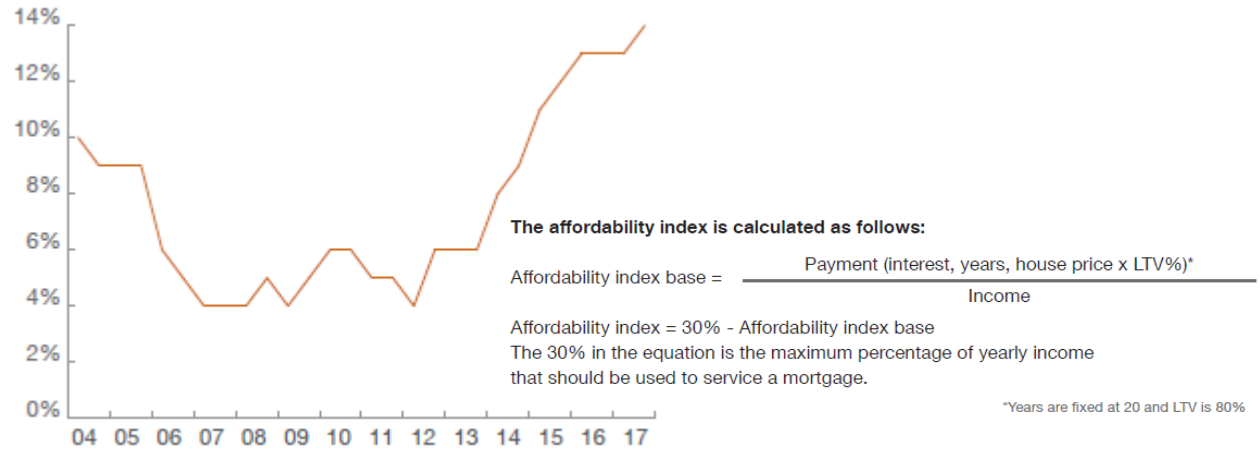

Figure 3.7: Affordability index for Italian household (pwc, 2018)

With regard to investments, it should be noted that the slight growth is mainly driven by extraordinary maintenance, while those relating to newly built houses remain at a historical minimum.

Other useful elements to define the framework of the Italian real estate market are the following:

- **The average price of new houses** is about 24% higher as compared to that of existing houses, according to the real estate portal Idealista.it.
- There is finally evidence that there is **a premium price for residential units** characterized by high energy class, at least in northern Italy, although it is not possible to accurately quantify it in the absence of a reliable reference database.
- **Italy's mortgage market is still small**, with outstanding mortgages equivalent to less than 22% of GDP in 2018, less than half of EU 28's average. In addition, only a minority share of the funding is earmarked for refurbishment works.

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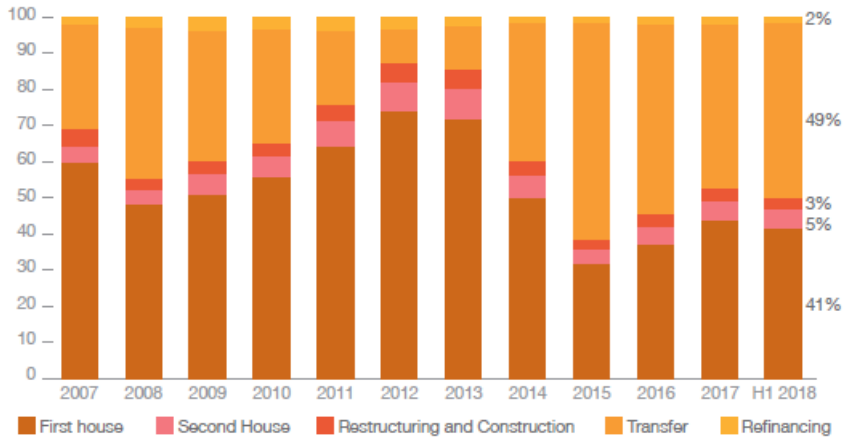

Figure 3.8: Mortage request by purpose (source: Bank of Italy)

Another element that characterizes the real estate market is that around 72.4% of the country's total households were owner-occupiers, an increase from 59% of total households in 1980 (Eurostat).

The figure is in apparent contradiction with the Italian legal framework, which is strongly unbalanced in favour of tenants, which discourages the purchase of apartments to obtain an income. In addition to the unfavorable tax context, there are also a number of factors that make such an investment quite risky for the landlord (i.e.: difficulty in evicting the tenant, even in the case of non-payment). Consequently, the Gross rental yields is one of the lowest in Europe, further eroded by the property tax, which in the case of more than one house of property is subject to the application of a high rate.

A rate that can be reduced only if the owner decides to rent the house at a controlled price, thus minimizing the profitability of making upgrades to the rented apartments, since he cannot rely on the revenue resulting from the increase in rents.

Looking at the building stock, the population is almost evenly split between detached and semi-detached houses and multy-family buildings, with the latter prevalent in the most densely populated cities and provinces.

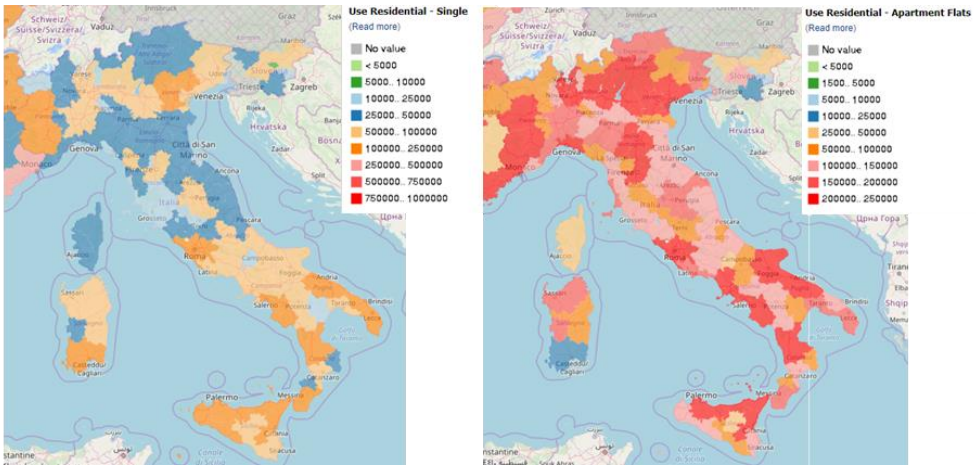

Figure 3.9: Building distribution by typology. Single housings and apartment flats (source: EeB-CA2 Mapping Tool)

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With regard to household energy costs, electricity costs are among the highest in Europe, while the cost of natural gas remains within the average of other Western European countries. This is mainly due to the different weight that levies and taxes have in the determination of the final cost, which in Italy encourages the consumption of natural gas, limiting the widespread use of electrical systems (such as heat pumps). Where multi-apartment buildings are supplied from a common system, a share of the costs of thermal consumption to each apartment is allocated on the basis of the actual consumption.

- **Policies and incentives**

The main instrument available in Italy to encourage the adoption of energy efficiency measures is the tax relief for the energy-efficient renovation of building stock. It consists of reductions of personal income tax (IRPEF) and corporate income tax (IRES) granted to cover, over a ten-year time horizon, up to 65% of the expenses incurred for the overall energy performance upgrade of the building, including major and minor renovations.

If the works are carried out under finance leases, the user is entitled to claim tax relief, which is then calculated on the basis of the cost incurred by the leasing company. The following in particular are eligible for the subsidy:

- individuals, including skilled tradespeople and professionals;
- taxpayers who earn business income (individuals, partnerships, corporations);
- professional associations;
- non-profit public and private organizations.

The following individuals may also take advantage of the subsidy:

- holders of a right in rem over immovable property;
- tenants' associations, for works on common areas of a multi-apartment building;
- tenants

The main limitation of this measure is that in order to benefit from it, a minimum income is required. in case of job loss, it also results in the loss of the tax benefit.

- **Drivers and barriers**

The main barriers identified are (Wolter, Pasinetti, & Ambiente Italia srl, 2016; Luque & Ruiz, 2018):

- ✓ Difficult in raising affordable finance, although the problem has been easing given the steady decline in interest rates
- ✓ Lack of trust in the construction and ESCO industry
- ✓ Bureaucratic obstacles (With specific reference to EPC-based and EPS-based models),
- ✓ Low Energy prices
- ✓ Pressure to reduce cost by the customers. Probably the legacy of years of economic crisis.

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- ✓ Financial institutions don't have the required technical background and capacities to properly assess an EPC project (With specific reference to EPC-based and EPS-based models)
- ✓ Split incentives between tenants and landlord
- ✓ Difficulties in finding standardised solutions, given the lack of homogeneity of the building stock
- ✓ Absence of feasible solutions for historical buildings

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3.3. Spain

- **Housing market in brief**

After the sharp correction in prices amidst the global crisis, the sector began to grow vigorously from 2014, driving the growth of the national economy. Cumulatively, investments in the real estate sector grew by 45% between 2013 and 2018, against GDP growth of 15% for the same reference period.

Although growth is conditioned by many factors and is distributed unevenly across the country, their main drivers appear to be:

- The decrease in the employment rate and, in parallel, in household
- The reduction of interest rates to extremely convenient degrees

The latter was determined not only by the low-interest policy, but also by a reduction in the lending margin due to a higher level of competitiveness of the financial sector and, in parallel, by the lengthening of the repayment period in the case of fixed-rate loans, making this mortgage type very attractive to borrowers (Alves & Urtasun, 2019) .

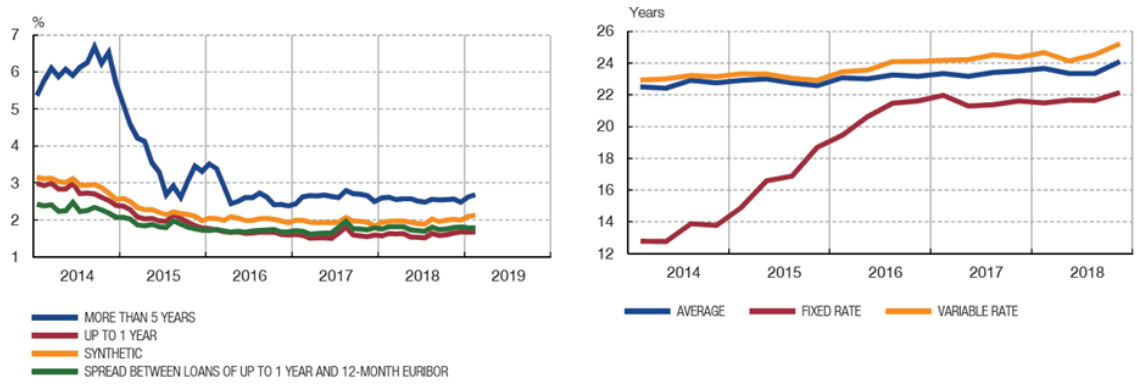

Figure 3.10: Interest rates of mortgages, on the left, and average loan repayment period, on the right. (source: Banco de España - Economic Bulletin 2/2019)

Over the last few years the working conditions of younger workers (under 25), whose wages have fallen by 15% (by 9% for workers aged between 25 and 29), have worsened. This resulted in an increase in the resident population of rented houses, even though on the whole it is still below the European average.

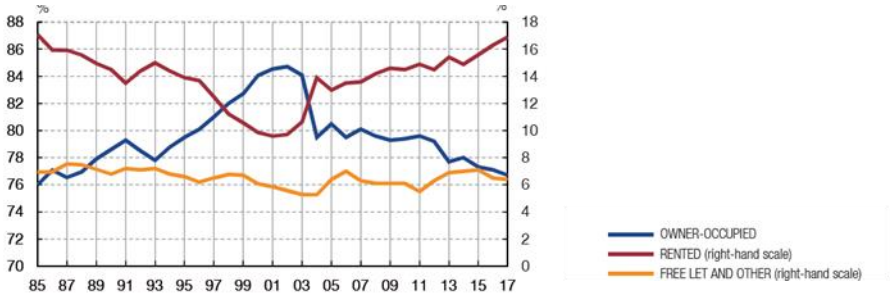

Figure 3.11: Tenure status (% of main residences)-. (source: Banco de España - Economic Bulletin 2/2019)

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In order to analyze the impact that this trend could have on investments in energy refurbishments, it should be noted that in the event that the landlord undertakes improvements, he is entitled to increase the annual rent on the basis of the legal interest rate, incremented by three points, applied to the total investment, less any public subsidies. But the rent increase cannot exceed 20% of the rent. Furthermore, owners are generally liable to pay property tax but it may be charged to the tenant, if so agreed in the contract, and this is commonly done.

Looking at the market segment, only 50% of the residential area is related to buildings built before 1980, with a slight prevalence (looking at the surface) of houses in detached or semi-detached houses, while the apartments tend to be the prevailing typology along the coasts and in the most densely populated areas.

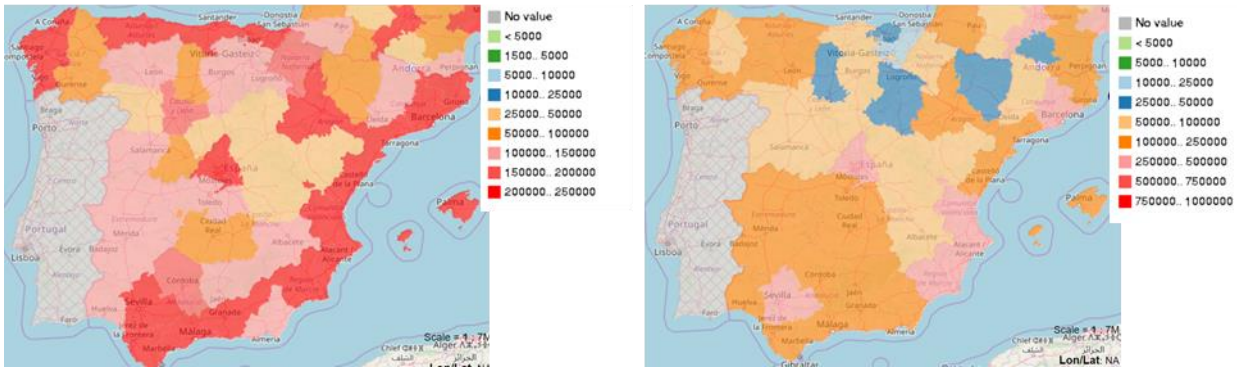

Figure 3.12: Building distribution by typology. Single housings, on the left, and apartment flats, on the right. (source: EeB-CA2 Mapping Tool)

Finally, it is worth noting that also for Spain, recent studies (Marmolejo-Duarte & Chen, 2018), show the evidence of a positive response of the real estate market to energy certificates, in the form of "market premiums" and "brown discounts", although their impact is still lower than in other countries (Netherland, United Kingdom)

In addition, energy costs, among the highest in Europe, are one of the possible drivers to encourage energy requalification. With regard to Multi-family buildings with centralized system, there is currently no regulation on how metering and heat cost allocation shall be deployed leading to uncertainty in the market.

- **Policies and incentives**

Following the State Housing Plan 2013-2016, in early March 2018 the new State Housing Plan 2018-2021 (Plan Estatal de Vivienda 2018-2021) has been launched. Like the previous one, it promotes a better energy efficiency for the residential sector though the support scheme of up to EUR 12,000 per house but includes new initiatives including funding to support young people under 35 years (up to EUR 10,800 financial support). [14]

- **Drivers and barriers**

[14] European Construction Sector Observatory - Country profile Spain 2018

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The main barriers identified are (Luque & Briano, 2018)[15]:

- ✓ Difficult in raising affordable finance, although the problem has been easing given the steady decline in interest rates
- ✓ Lack of trust in the construction and ESCO industry
- ✓ Lack of support from the government
- ✓ Difficulties in finding standardised solutions, given the lack of homogeneity of the building stock
- ✓ Lack of standardised Measurement & Verification practices
- ✓ Low price premium for energy requalification
- ✓ Low financial availability, especially among young people
- ✓ Absence of feasible solutions for historical buildings

Compared to the other countries of the European Union, energy prices are not seen as a barrier, as they are among the highest in Europe, and instead constitute the main drivers for renovations.

[15] www.qualitee.eu

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3.4. France

- **Housing market in brief**

Compared to other countries more affected by the global crisis of 2008, France experienced a different development of market prices and investments in the sector. After a rapid recovery, it has seen a slow but steady decline both in term of price and investments, which came to a halt in 2015. Determining factors, as in other countries, have been the fall in the unemployment rate and the persistence of extremely low rates for mortgage loans [16].

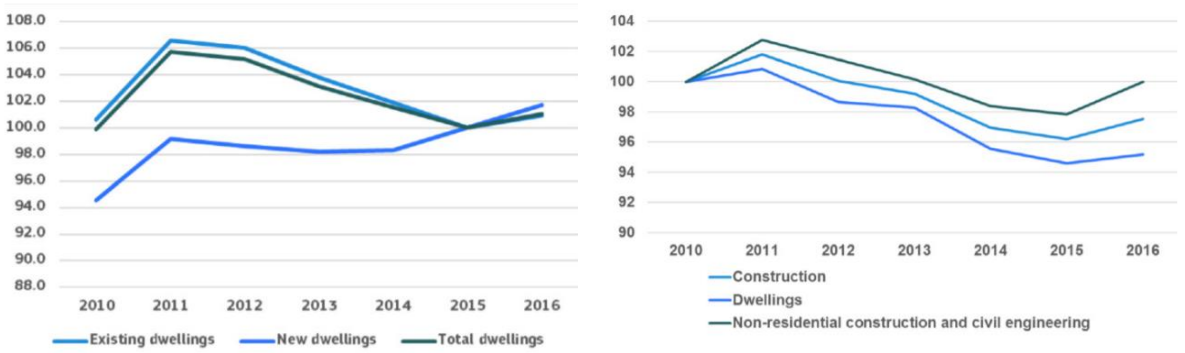

Figure 3.13: House price index in France, on the left, and investment in the France construction sector (source: European Construction Sector Observatory, 2018)

Looking at the building stock, more than half of the total housing stock in France (19 million dwellings) was built prior to 1975, while the rate of new constructions built year-on-year has been decreasing since 1980, with an inadequate trend to meet the market. Of the overall residential floor area, 68% is occupied single-dwelling buildings, followed by multi-dwelling buildings at 32%.

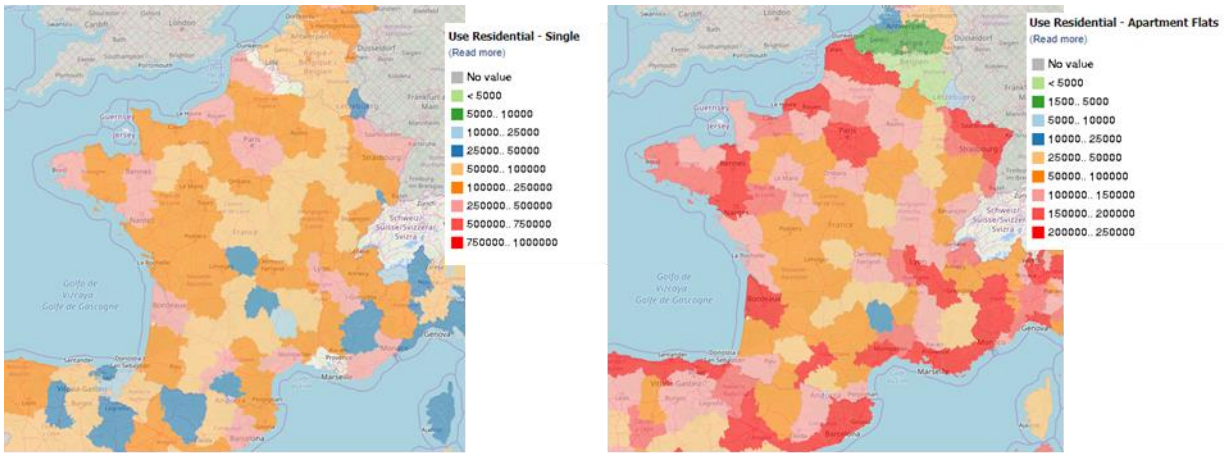

Figure 3.14: Building distribution by typology. Single housings, on the left, and apartment flats, on the right. (source: EeB-CA2 Mapping Tool)

[16] European Construction Sector Observatory - Country profile France 2018

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79% of the apartments are privately owned and, of these, only 58% occupied by the owners. This is followed by private tenants, who occupy some 21% of the residential dwellings, with the remaining 16% being social housing units (Ostermeyer, et al., Building Market Brief France, 2018).

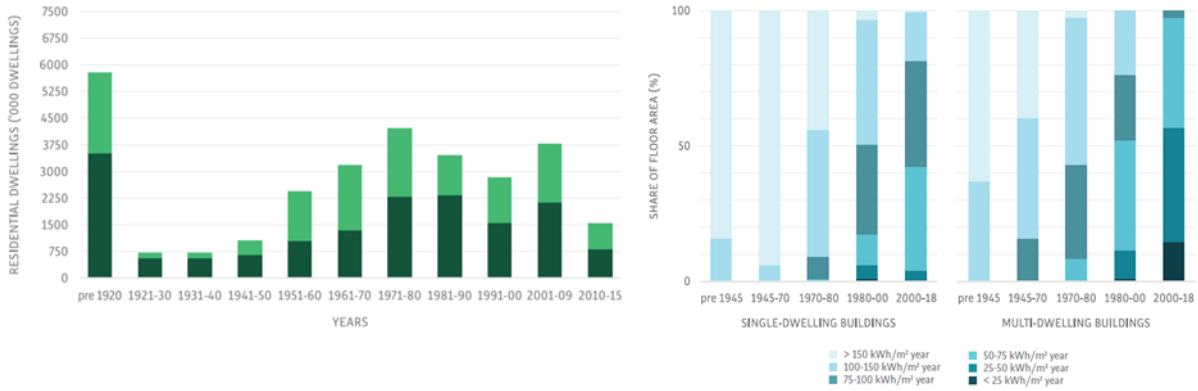

Figure 3.15: residential building space trends, on the left, and specific final energy demand distribution of the French building stock according to building age and type, on the right . (Ostermeyer, et al., Building Market Brief France, 2018)

In this respect, it is useful to mention that the French law is strongly pro-tenant, even though initial rents are freely determined. The tenant can rarely be evicted before the term ends and even in case of non-payment of rent, the landlord has to wait till the end of the term. In addition, once the initial rental price has been agreed, it is very difficult to ask for higher rents, even after improvements to the property, that are above the average of the INSEE index of construction costs.

In line with the trend in investments, construction costs also remain high, while energy costs remain among the lowest in Europe.

With regard to Multi-family building with centralized system, a 70% share of consumption is split between apartments, according to actual consumption measured by individual heat meters or by individual heat cost allocators.

- **Policies and incentives**

French Government has adopted a wide selection of financial instruments and tax measures in order to promote the renovation of existing buildings. The Energy Transition Tax Reduction (Crédit d'impôt pour la transition énergétique – CITE) entails a 30% tax credit, up to a maximum of EUR 8,000 (16,000 for couples), on the expenditures incurred for energy efficient renovation works over a five-year period. It can be combined with other measures, such as the Zero Interest Eco-loans, to which owners of apartments built before 1990 may have access, on the condition that they are the primary residence. In this case they are entitled to zero interest loans of up to EUR 30,000 to be repaid in a period of time not exceeding 15 years, to finance at least two energy efficiency interventions[17] .

[17] Concerted Action EPBD 2015-2018 –France. Status at December 2016

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The Living better programme (habiter mieux) provides advice and financial support, on the basis of the beneficiaries' income, in order to make Energy improvements.

Another measure adopted to support the renovation of the building stock is the Zero-Interest Loan Programme (Prêt à Taux Zero – PTZ) which, within the general aim of supporting people who want to build or buy their first new dwelling, can also finance the purchase of an existing dwelling requiring major works

- **Drivers and barriers**

The main barriers identified are (Ostermeyer, et al., Building Market Brief France, 2018) (Boza-Kiss, Bertoldi, & Economidou, 2017):

- ✓ Lack of trust in the construction and ESCO industry and more in general, in the promised outcome of the projects.
- ✓ Long payback period of the alternatives
- ✓ Overall budget limitation, although the problem has been easing given the steady decline in interest rates
- ✓ Absence of feasible solutions for historical buildings

Main drivers to energy renovation are:

- ✓ desire to improve the level of comfort and property's value,
- ✓ low interest rate
- ✓ financial incentives

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3.5. Germany

- **Housing market in brief**

Compared to other developed countries, house prices in Germany have not suffered from the global financial crisis, maintaining a substantially steady growth trend since 2008. Growth trend driven primarily by immigration, at first coming from southern European countries, then by flows associated with recent migration crises Other drivers have been: the higher purchasing power, the presence of low rates for mortgage loans, as well as the absence of alternative forms of low-risk investment (Ostermeyer, et al., Building Market Brief Germany, 2018).

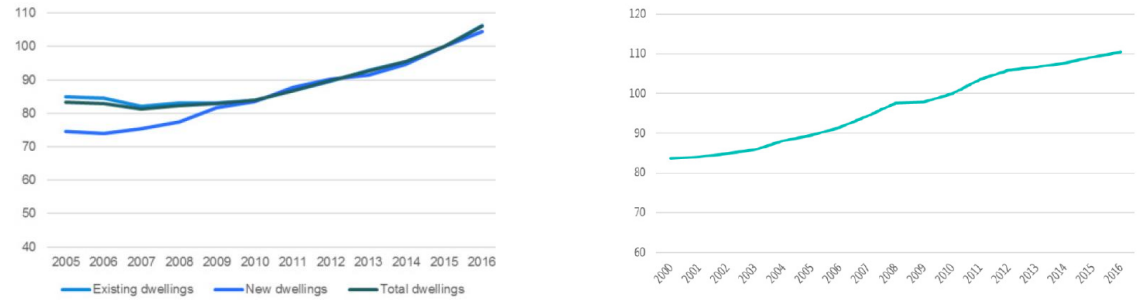

Figure 3.16: House price index in Germany, on the left, and investment in the German construction sector (source: European Construction Sector Observatory, 2018)

Looking at the composition of the building stock, almost 55% of the apartments in Germany have been built before the 1970s, and approximately 63% before 1976–79, when the first Energy Saving Act (EnEG) was introduced to establish building codes for housing. As a result, the vast majority of apartments built before that period consume more than 100 kWh/m2 year.

Of the residential dwellings, 30% are detached or semi-detached houses, whilst the remaining are multi-dwelling.

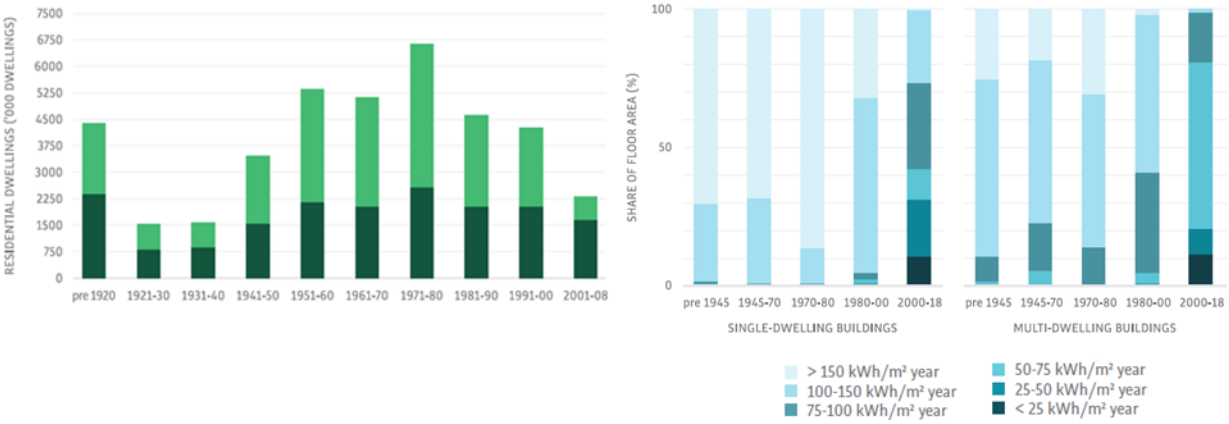

Figure 3.17: residential building space trends, on the left, and specific final energy demand distribution of the French building stock according to building age and type, on the right (Ostermeyer, et al., Building Market Brief Germany, 2018)

Another peculiar feature of the German context is the very low rate of owner-occupied residential space (only 46% of residential dwellings are owner-occupied). However, despite the fact that the legislation is rather guaranteeing for tenants, rents can be negotiated freely, provided that they do not significantly

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exceed market values. In addition, in most cases, the tenant is also required to pay the property tax (Grundsteuer), which usually the landlord transfers in the form of Nebenkosten (supplementary costs).

With regard to consumption, the main sources used for heating the apartments are natural gas, fuel oil and electricity, whose price, strongly conditioned by taxes and levies, is among the highest in Europe.

In case of Multi-family building with centralized system, a 70% share of consumption is split between apartments, according to actual consumption measured by individual heat meters or by individual heat cost allocators.

- **Policies and incentives**

Measures span from investment grants for fuel-cell heating system to awareness campaigns and advisory services for homeowners. Among financing programme, the KfW Energy efficient Construction Programme is the best known and widespread, as approximately one out of three retrofits benefited from it. The programme provides funding in the form of low-interest loans at particularly favorable conditions (long repayment period, initial exemption period). The loan can cover up to a maximum of EUR 100,000 per building or to a maximum of 100% of the eligible costs. The Heating Optimisation Funding Programme focuses on the renovation of the heating systems and covers up to 30% of optimisation expenses for a maximum amount of EUR 25,000 [18][19].

- **Drivers and barriers**

The main barriers identified are (Ostermeyer, et al., Building Market Brief Germany, 2018; Schulze-Sturm & Esseling, 2018):

- ✓ High costs of investments
- ✓ Lack of trust in the construction and ESCO industry and more in general, in the promised outcome of the projects, especially in case of technical complexity of buildings.
- ✓ Regulatory and administrative barriers in the public sector (tenant law)
- ✓ Split incentives between landlords and tenants – the incentive of the tenant is to save as much energy/money for heating etc. as possible while the incentive of the landlord is to have as few problems with the plant as possible.
- ✓ Long payback period of the alternatives

With respect to other EU countries, neither budget limitation nor low energy prices are seen as a relevant barrier.

Main diver to implement EE measures is the current economic situation with low interest rates. Another key trigger of renovation is the change of ownership of privately-owned building. In such cases high legal standards have a decisive impact on the extend of the energy efficiency upgrade.

[18] Concerted Action EPBD 2015-2018 –Germany. Status at December 2016

[19] European Construction Sector Observatory - Country profile Germany 2018

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3.6. Poland

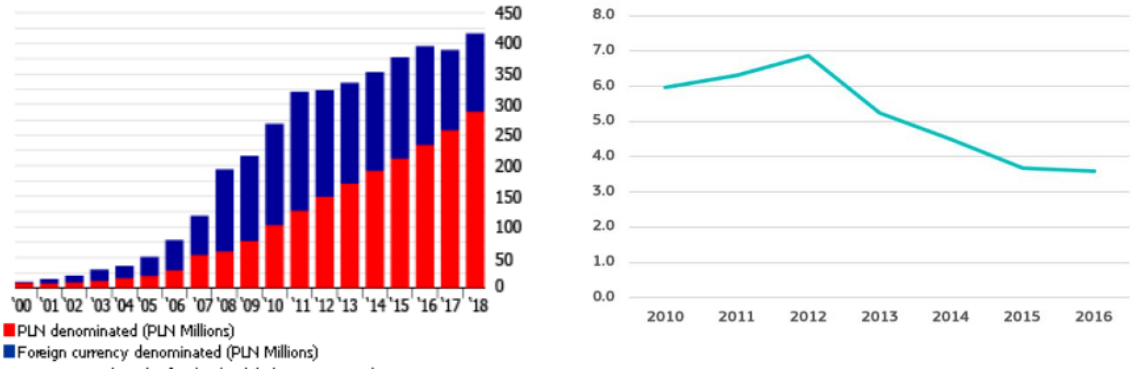
- **Housing market in brief**

The Polish residential market is the largest in central and eastern Europe. In detail, the stock of residential buildings represents the 67% of the total of existing buildings in Poland, half of which were built before 1980 and, therefore, not isolated or isolated at sub-optimal levels.

That said, despite the (deep) renovation rate is currently very low, Poland's housing market remains strong, due to the country's excellent economic performance (GDP grew by 5,1% in 2018), wage rises and declining unemployment (dropped to a record level of 5,6%), combined with historic low interest rates[20].

Consistent with the growing demand:

- ✓ The apartment prices in the major cities increased by more than 7% during 2018,
- ✓ Residential investment is on the rise (Dwelling starts: + 7.7% Dwelling completions: + 3.8%)
- ✓ Mortgage market has grown steadily since 2001 (1,3% of GDP), to reach almost 20% of GDP in 2018. In line with the progressive reduction of the mortgage interest rates. Loan-to-Value ratios of mortgages have increased substantially, up to 80% in large cities.
- ✓ Gross rental yields are goods, especially in major cities, at around 6%.



On the other hand, downsides are:

- ✓ The high renovation costs in the light of the purchasing power
- ✓ The limited importance attributed to the Energy Performance Certificates, which do not play an important role on the decision-making process when buying or renting a house and do not influence the transaction price. it is not therefore possible to credit an increase on property value, linked to a building's energy refurbishment.

Despite the climatic context, which leads to theoretical consumption during the winter period well above the European average (European Heating Index>110), energy costs for heating are low. Indeed, the most common heating source is coal, burned in old boilers and, even in cases where heating is provided by natural gas boilers, heating costs remain low, since price for natural gas in Poland remains among the lowest in Europe. In case of Multi-family building with centralized system, the Energy Efficiency Law

[20] European Construction Sector Observatory - Country profile Germany 2018

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sets only general principles for the allocation of heat costs in multi-apartment buildings but does not prescribe fixed ranges (e.g. 30%/70%) for the distribution of the costs according to metered consumption.

- **Policies and incentives**

In Poland there are several mechanisms supporting the improvement of energy efficiency of existing buildings and promoting the goals set in the National Action Plan for Energy Efficiency (NEEAP). Leaving aside the financial instruments exclusively addressed to public buildings the main measures to support investment in this field are [21]

- ✓ **Thermo-renovation and Repairs Fund,** whose main objective is to provide financial assistance for projects to improve the condition of existing housing. The scheme is mainly focused on multi-family apartments, while for detached house the procedure is so complicated that their owners rarely apply for it.

  Under this scheme he investor is entitled to a grant to repay part of the loan disbursed (up to 20 %) for the investment if the energy audit shows that the project will:
  1) Reduce the annual energy demand (for heating and DHW):
  2) Decrease annual energy losses in the district heating network, at least by 25%; or
  3) Reduce annual costs of obtaining heat from the heat source, at least by 20%; or

  Change the energy source to RES or cogeneration.
- ✓ **Ryś**, which provides grants for thermo-renovation of single-family buildings; Renovation works eligible for incentives are
  1) Interventions improving the thermal performance of the envelope (e.g. insulation of external wall, change of windows)
  2) Modernisation of heating and DHW system, including change of heat source and use of RES

  Furthermore, the interventions have to be compliant with the requirements set out for Polish nZEBs
- ✓ **"Clean Air"** - which will support energy modernisations and the replacement of heat sources, specifically intended for the replacement of coal burners. Two thirds of the fund will be used as a grant, while only one third as loans. The grants range from 30 to 90 per cent of the eligible investment costs on the household income

- **Drivers and barriers**

The main barriers identified are (Gula, Hoff, Ciesielska, & Zaborowsk)[22]:

- ✓ High costs of investments
- ✓ Low energy prices, due to the widespread use of coal for domestic heating
- ✓ Long payback period of the alternatives
- ✓ Lack of awareness about the benefits in terms of energy performance and indoor air quality

[21] Concerted Action EPBD 2015-2018 –Germany. Status at December 2016

[22] www.ibroad-project.eu

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- ✓ The EPC does not play an important role on the decision-making process when buying or renting a house
- ✓ The extensive use of grants and the absence of sophisticated financial mechanisms hinders the mobilisation of resources from the private sector, thus limiting the effectiveness of the incentives in place.
- ✓ Financial instruments, such as guarantees and ESCOs, are considered risky due to economic and political instabilities;
- ✓ Still high interest rates
- ✓ Exclusion of ESCO from projects financed by nonrefundable grants

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4. Main results from replicability analysis

This is the core chapter of the report and it aims at evaluating BM replicability, by matching the BM key factors (identified in Chapter 2) and the main features of the countries selected as representative of the European context (e.g. the analysis of the housing market, main policies and incentives as well as barriers hindering the implementation of EE measures in existing buildings), identified in Chapter 3. Below the replicability analysis is provided per each BM, leveraging also on data from the geo-cluster tool when available.

4.1. One Stop Shop based on a step by step approach: Enerphit innovative BM

Enerphit, through the step-by-step approach, can be a driver to trigger the implementation of deep renovation processes in those contexts characterized by:

- excessively cautious attitudes of the investors. Indicators of lack of confidence. Typical attitudes following economic crises
- Lack of trust in expected outcomes of preliminary renovation projects
- economic return expected from energy savings

In these environments, the positive experience, both in terms of energy savings and the increase in internal comfort resulting from the first stage of the investment, can bring the confidence needed to undertake sequential investments as well, accelerating their timing. Essential conditions for the process to result in an extensive renovation in a rather short time are:

- Possibility to combine different incentives
- Implementation of incentives encouraging the adoption of multiple measures at the same time, or which are triggered when minimum intervention thresholds are exceeded.
- Low interest rates
- Low levels of household debts and, above all, a minimum income threshold that allows investments to be sustainable

In addition, in order for the investor to benefit from the energy savings, in the case of multi-family buildings with centralized systems, the distribution of costs according to actual consumption must be admissible.

The following table shows the drivers identified in paragraph 2.1.3. These have been scored from 0 to 3 according to each country analyzed, on the basis of the finding of chapter 3. The higher the score, the greater the possibility for the country to meet the BM's requirements.

The judgement given to the first two synthetic indicators, (1) Combinability of different forms of incentive and (2) Incentives to encourage the adoption of multiple measures at once, is obtained from a qualitative analysis of the main existing mechanisms in the different countries. For instance, if in Italy, on the one hand, the tax incentives are proportional to the interventions made, on the other hand, being deductions, the maximum limit is mainly represented by the taxes on income to be paid. Thus deterring major investments for low-income households. France has been given a higher score for the possibility to combine tax deduction mechanisms with zero-interest loans.

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Table 4.1: Results of Enerphit replicability

	Denmark	Italy	Spain	France	Germany	Poland
Combinability of different forms of incentive			X	XX	X	X
Incentives to encourage the adoption of multiple measures at once	X		X	X	X	XX
Low interest rates	XXX	XX	XX	XXX	XXX	X
Minimum household income	XXX	XX	XX	XXX	XXX	X
Heat metering in case of centralized system	XXX	XX		XXX	XXX	

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4.2. EPC plus

In addition to the Key drivers highlighted in paragraph 2.3.3, in order for Energy preformance contracts models to be replicable on a large scale, it is necessary to verify the absence of their characteristic barriers, which can be of 3 types:

1. Regulatory and administrative barriers
    a. Lack of technical background in municipalities.
    b. Uncertainty of legal and regulatory framework.
    c. Possibility for ESCOs to have direct access to in subsidy programs
    d. Compatibility with current regulations on rental contracts
2. Structural barriers
    a. Lack of trust. This is a generalized problem in EPC markets.
    b. Lack of standardised M&V practices.
    c. Low energy prices - the incentive for savings is too low due to the low energy prices - especially for bigger companies.
    d. Split incentives between landlords and tenants
3. Financial barriers
    a. Financial institutions not having the required technical background and capacities to properly assess an EPC project.
    b. The credit—worthiness of an EPC provider

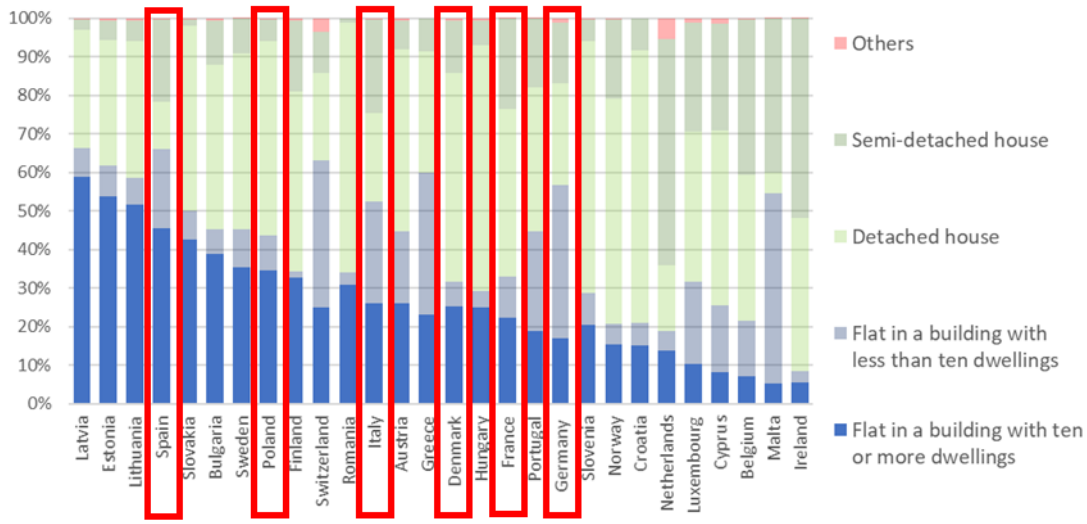

Figure 4.1: Distribution of population by building – Source: Eurostat

The following table shows the drivers identified in paragraph 2.3.3, as well as the synthetic parameters relating to the presence/absence of the barriers indicated above.

These have been scored from 0 to 3 according to each country analyzed, on the basis of the analyses reported in chapter 3. The higher the score, the greater the possibility for the country to meet the requirement. The rating for the absence of structural barriers is attributed qualitatively also considering (1) the share of rented apartments in the total building stock (Figure 4.2) and (2) the energy costs. The one on the absence of financial barriers takes into account the current interest rates.

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Table 4.2: Results of EPC Plus replicability

	Denmark	Italy	Spain	France	Germany	Poland
Market segment (single houses or building with less than 10 dwellings)	XXX	XX	X	XXX	XX	XXX
Absence of regulatory barriers	X	X	X	X		
Absence of structural barriers	X	X	X	X	X	
Absence of financial barriers	XX		X	XX	XX	
Presence of incentives , even if the investments are borne by ESCOs.		X	X	X		

As shown in Figure 4.1, the countries with the highest percentage of detached and semi-detached houses, the market segment targeted by EPC plus, are France.

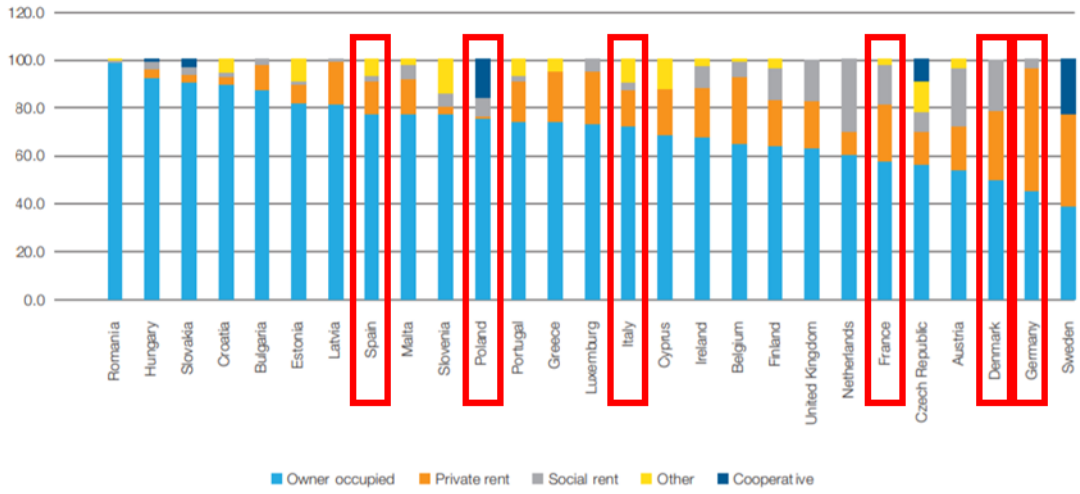

Figure 4.2: Tenure split in EU Member States – Source: Housing Europe. Housing markets in European Union

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4.3. Energiesprong

Ideally, the market segment targeted by this business model could be represented by both single houses and multi-family houses, provided that they are not geometrically complex. However, looking at single-family houses, the only countries that appear to be characterized by the ideal market segment are Denmark, Germany and Poland [23].

Figure 4.3: Single Family and Terrace Houses in Denmark, Spain and Italy (Source: Tabula webtool)

For the other countries, it makes sense to focus exclusively on multi-family buildings, built prior to 1980. Given the higher investment, this type of building can deserve the effort to find customized solutions, even in case of higher level of complexity.

[23] http://webtool.building-typology.eu

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 768287.

Figure 4.4: Single Family and Terrace Houses in France, Germany and Poland (Source: Tabula webtool)

Other major factors are: (1) a stable upward trend in real estate market (Figure 4.5), (2) high average disposable income in households and (3) a relative low average household debt (Figure 4.6)

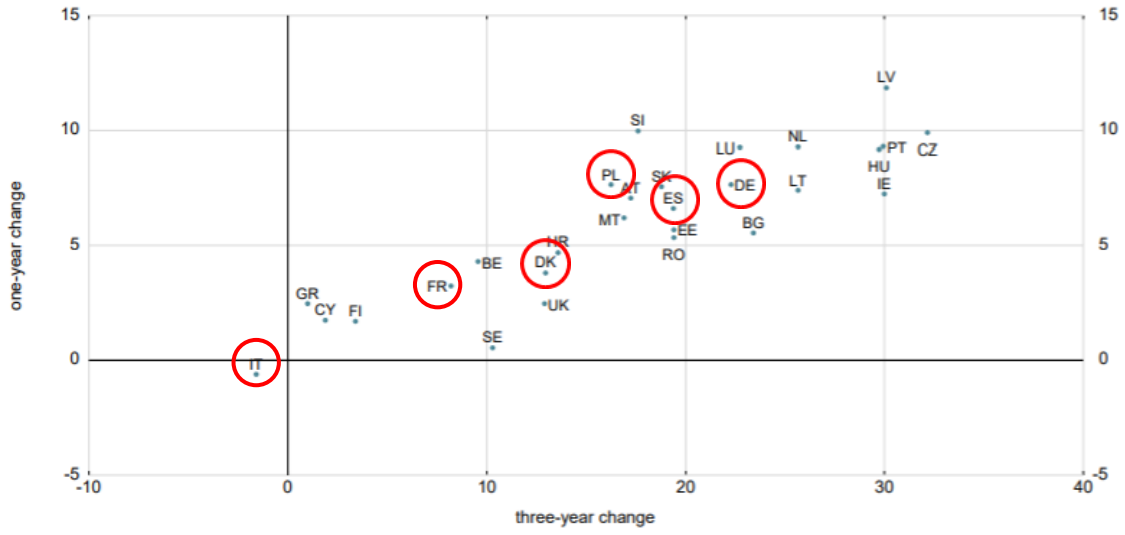

Figure 4.5: Change in nominal property price (EU; percentages; 2018)

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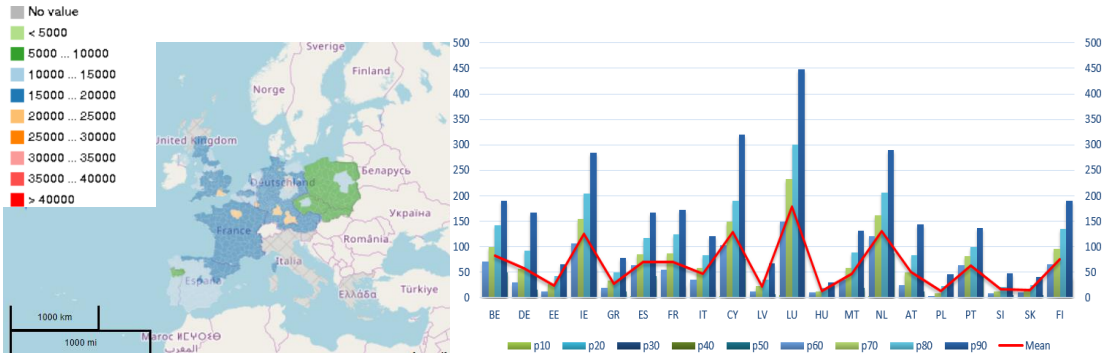

Figure 4.6: Household disposable income, on the left, (Source: EeB-CA2 Mapping Tool) and Total debt, among household holding debt – distribution (Source: Eurostat)

The following table shows the drivers identified in paragraph 2.3.3. These have been scored from 0 to 3 according to each country analyzed, on the basis of the finding of chapter 3. The higher the score, the greater the possibility for the country to meet the BM's requirements.

Table 4.3: Results of Energiesprong replicability

	Denmark	Italy	Spain	France	Germany	Poland
Wide availability of single or multi-family buildings, with not overly complex geometries	XXX	X	XX	XX	XXX	XXX
Upward trend in real estate market prices	XX		XXX	X	XXX	XXX
High household income, compared to the cost of investment	XXX	XX	XX	XXX	XXX	X
Grants and tax incentives for this specific approach		X	X	X	X	X
Limited segmentation of the building stock	XX		X	X	XX	XX

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4.4. BetterHome

The following table shows the drivers identified in paragraph 2.4.2. These have been scored from 0 to 3 according to each country analysed. The score is awarded on the basis of the potentialities of offering a service capable of meeting the specific requirement, which lives up to the Danish experience.

In addition to the mentioned drivers, other elements that can influence the replicability of BetterHme are:

- High energy costs
- Limited segmentation of the building stock in order to be able to deliver standardized solutions, that can be managed with digital tools,
- Accessibility to low-interest loans

Table 4.4: Results of BetterHome replicability

	Denmark	Italy	Spain	France	Germany	Poland
Structure the supply-side	XXX	XX	XX	XXX	XXX	X
Use digital solutions to bring added value to the end-users	XXX	XX	XX	XXX	XXX	XX
Build awareness for the end-users	XXX	XX	XX	XXX	XXX	XX
Safeguard the good reputation	XXX	XX	XX	XXX	XXX	XX
High energy costs	XXX	X	XX		XXX	
Limited segmentation of the building stock	XXX	X	X	X	X	X
Accessibility to low-interest loans	XXX	XX	XX	XXX	XXX	X

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4.5. EUROPACE

Table 4.5 reports the main outcome of the analysis mentioned in the paragraph 2.5.2, carried out in the framework of the EUROPACE Project, aimed at assessing the legal and fiscal readiness for the adoption of an on-tax financing mechanism across EU28.

Table 4.5: Results of EUROPACE replicability in EU28[24]

Category	Countries	Main remarks
Very adequate countries (9):	Austria, **Denmark**, **Germany**, Luxembourg, the Netherlands, Portugal, Romania, Slovenia, and **Spain**	Countries where all, or at least two of the three key criteria have been met; oftentimes, those in which on-tax financing has already been piloted
Moderately adequate countries (10)	Belgium, Bulgaria, Finland, **France**, Hungary, Ireland, **Italy**, **Poland**, Sweden, and the UK	Predominantly countries with stable and well-institutionalized property-tax systems, but with weak enforcement procedures or insufficient experience in cooperation with the private sector
Less adequate countries (6):	Czechia, Estonia, Greece, Latvia, Lithuania, and Slovakia	Predominantly countries in which the administration and collection of property related taxes is centralized
No-go options (3):	Croatia, Cyprus, and Malta	Countries with no property-related tax in place The study and ranking compiled revealed some overarching trend

In addition to the legal and fiscal aspects assessed in the context of the above analysis, two additional key drivers have been identified. Namely:

- Level of public indebtedness
- Possibility for the owner to pass on the property tax to the tenant, in order to overcome the split incentive problem

The first synthetic indicator reported in Table 4.6, *Legal and fiscal readiness*, has been evaluated on the basis of the outcomes obtained in the framework of the EUROPACE Project. The others on the basis of the findings from the overall framework provided in chapter **Erreur ! Source du renvoi introuvable.**.

Table 4.6: Results of EUROPACE replicability

	Denmark	Italy	Spain	France	Germany	Poland
Legal and fiscal readiness	XXX	XX	XX	XX	XXX	X
level of public indebtedness	XXX		X	X	XX	XX
Possibility for the owner to pass on the property tax to the tenant	XXX	X	XX	XX	XXX	XX

[24] https://www.europace2020.eu/project-deliverables

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 768287.

5. Conclusions

This report has been prepared in the framework of WP5 “Promotion of new business models and validation through business cases” of STUNNING project “SusTainable bUsiNess models for the deep renovation of buIldiNGs” (GA: 768287). The document reports about activities carried out within the framework of the replicability analysis carried out through geo-clustering approach.

This task aimed to study the replicability of the most promising BMs identified in the framework of Task 5.1, in the light of the lessons learned by the detailed analysis of their application in real contexts, that allowed to identify the key elements having a relevant role for the BM success.

The in-depth analysis of the results obtained from the previous tasks has allowed to finalize a list of key factor essential to the replication of each promising BM.

Afterwards, a comprehensive overview of the six selected countries, Denmark, Italy, Spain, France, Germany and Poland, provided the background against which to verify the existence of the critical conditions (key factor for replication) needed to ensure the success of the BMs..

Finally, chapter 4 provides the results in the form of matrices, where each key factor has been qualitatively evaluated on a scale from 0 to 3, according to the likelihood for each country to meet such requirement. Charts that follows shows the result obtained with respect to each most promising Business Model identified in the framework of Task 5.1

Enerphit

From the analysis, it emerges that most favourable country for the BM replication are Germany, France and Denmark, driven above all by the easy accessibility to financing. The greatest difficulties are found in Italy and Spain, where incentive schemes are not able to compensate for the greater difficulties to access credit. Moreover, Spain and Poland, since they haven’t yet introduced measures for the adoption of heat metering in multi-family buildings with a centralized system, preclude the adoption of this model for this market segment.

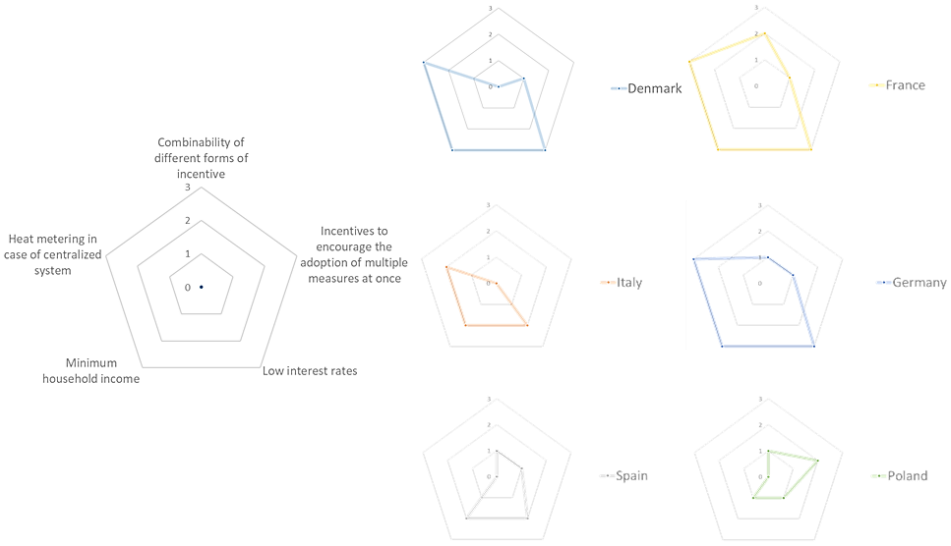

Figure 5.1: Enerphit -Results from replicability analysis

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EPC plus

EPC plus is overall difficult to replicate. The countries with the greatest potential are France and Denmark, both given the presence of the appropriate market segment and the greater ease of access to credit, crucial for SMEs involved in the Partnerships for Innovative Energy Services.

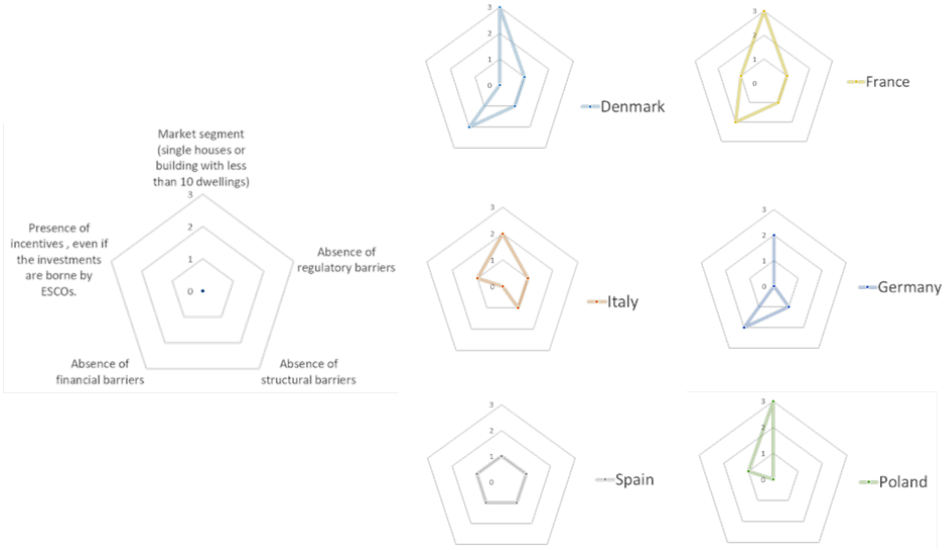

Figure 5.2: EPC plus -Results from replicability analysis

Energiesprong

Energiesprong shows the widest likelihood of replication in Denmark and Germany. the opposite is true for Italy, both for the large fragmentation of the building stock, and the current housing market conditions, which prevent investment in expensive works.

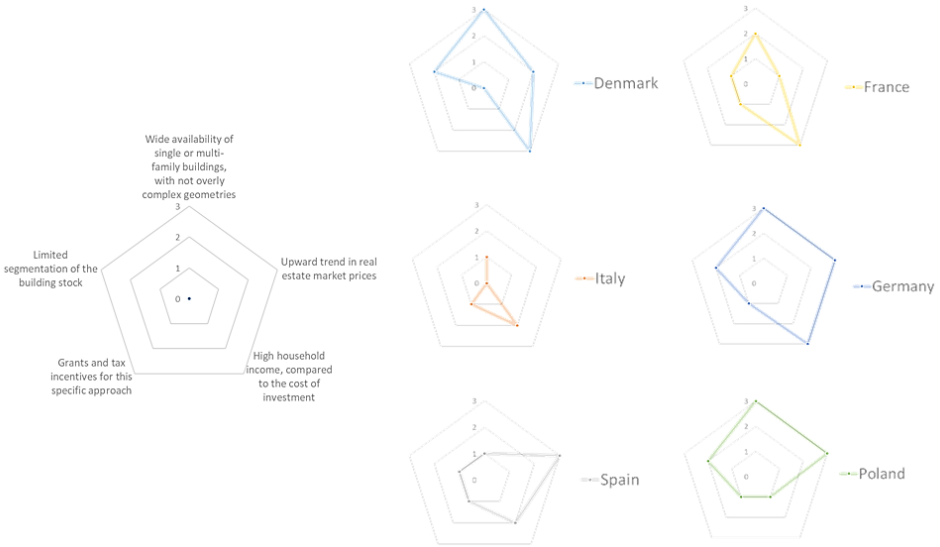

Figure 5.3: Energiesprong -Results from replicability analysis

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BetterHome

Leaving aside Denmark, where Betterhome has already been extensively tested, the country with the greatest potential for replicability is Germany, although here too the great fragmentation of the building stock hinders the use of user-friendly digital tools with standardized packages of solutions.

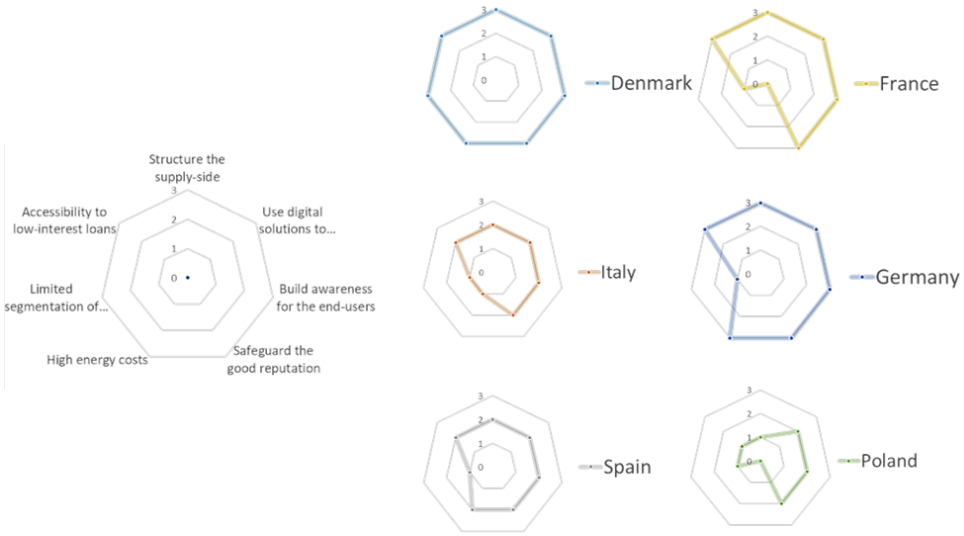

Figure 5.4: Energiesprong -Results from replicability analysis

EUROPACE

Denmark and Germany are the countries with the best potential for this model of WB, especially Denmark that, through this innovative financing mechanism, could compensate for the lack of incentives provided at national level. Italy is the country that presents the greatest difficulties, also enhanced by the difficulty, in case of rented dwellings, to transfer the property tax on tenants.

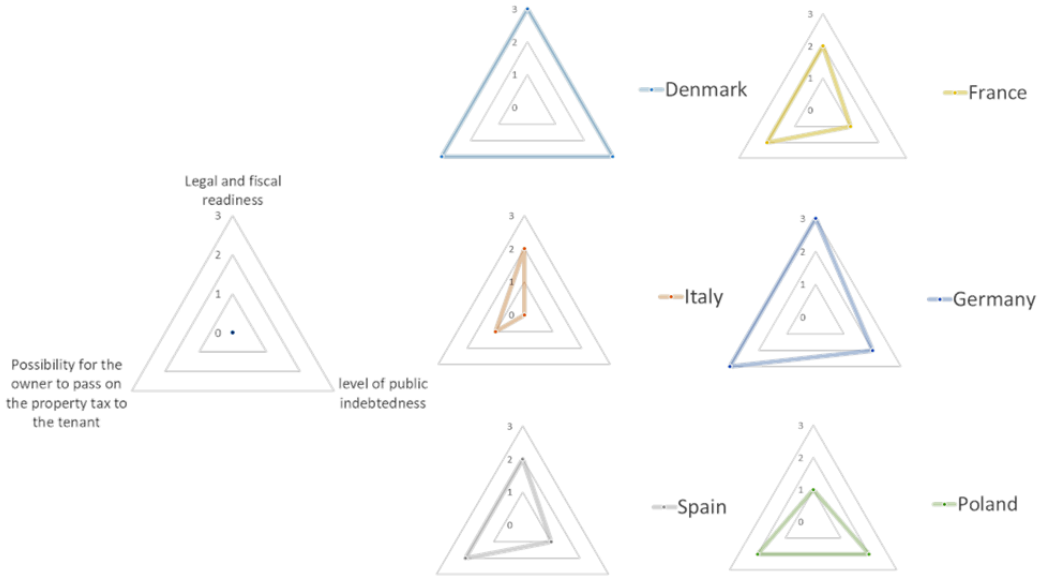

Figure 5.5: EUROPACE -Results from replicability analysis

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