



**STUNNING**



## Policy brief



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## 1. Introduction

**40% of Europe's energy consumption comes from buildings**, and they generate 36% of GHG emissions in the EU. With a staggering 97%<sup>1</sup> of the housing stock estimated as being energy inefficient, **the building sector is one of the key enablers for achieving low carbon economy goals for 2050**. However, the annual rate of home and commercial building renovation (around 0,4 -1,2%<sup>2</sup>) is well under the 3% required to achieve such goals. There is a need to accelerate the large-scale implementation of energy efficient refurbishment solutions and increase the renovation level to 3% per year by 2030.

A major structural challenge first needs to be overcome: the European building sector is highly fragmented (with over 95% of SMEs) and not yet able to offer holistic solutions for deep renovation at acceptable cost and quality. Renovation processes are seen as costly, time-expensive, disruptive and risky by the consumers. Innovative business models which allow consumers and the market to invest with confidence in the long term therefore need to be developed.

Another key challenge is to encourage the involvement of stakeholders representing different interests and different responsibilities influencing the potential solutions and actions. This regards not only the choice of technologies, but also the design and renovation methods, as well as socio-economic issues such as financing of the investment, user acceptance and behaviour.

STUNNING aimed at addressing these challenges, with the overall objective of engaging with the whole community of stakeholders to accelerate the adoption of new business models for energy-efficient buildings based on integrated, adaptable and affordable refurbishment packages, including decentralised energy generation, which will contribute to reaching the targeted EU renovation rate.

The objective of this document is to provide a very short summary of STUNNING findings, key takeaways and recommendations from our final event as well as insights to the European Commission for future policy making, structuring funding schemes and approaches as well as new focus areas for tenders and calls. More information on the project results can be found on our platform [Renovation Hub](#) and in our final publication<sup>3</sup>.

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<sup>1</sup> According to a recent study conducted by the Building Performance Institute Europe (BPIE), 97% of European buildings are energy-inefficient, meaning they must be upgraded to comply with the 2050 vision of decarbonisation. This figure is much higher than the 75% previously estimated.

<sup>2</sup> Source : <https://ec.europa.eu/energy/en/topics/energy-efficiency/energy-performance-of-buildings>

<sup>3</sup> Available on the Renovation Hub (<https://renovation-hub.eu/>) in the Download section





## 2. European Framework

The 2018 revised Energy Performance of Buildings Directive (EPBD) is the central EU's legislation when it comes to reducing the energy consumption of buildings. It promotes the use of smart technology in buildings to streamline the existing rules, including among other a **zero-emission building stock target by 2050**, a **smart readiness indicator (SRI)**, the **rollout of e-mobility infrastructure**; and the mobilisation of **public and private financing for renovation** activities to tackle **energy poverty**.

According to article 2a, EU countries will have to establish **stronger long-term renovation strategies**, aiming at **decarbonising the national building stocks by 2050**<sup>4</sup>, with indicative milestones for 2030, 2040 and 2050, measurable progress indicators and with a solid financial component (all Member States are obliged to submit their 3<sup>rd</sup> long-term renovation strategy by 10 March 2020). The foreseen long-term renovation strategies should feature “financial mechanisms, incentives and the mobilisation of financial institutions for energy efficiency renovations in buildings,” including energy efficient mortgages for renovations, and provision of, “accessible and transparent advisory tools and assistance instruments such as one-stop-shops”. **The strategies will need to clearly set out how to overcome a number of barriers that currently limit the deep renovation rate of private households.**

The ambitious target of achieving **Europe's climate neutrality by 2050** has been further reinforced by European Commission President-elect Ursula von der Leyen through a proposal for a **European Green Deal**. The Green Deal (branded as a Europe's hallmark) will make Europe world's first climate-neutral continent. In Mrs. von der Leyen “Agenda for Europe”, the construction sector is recognised as one of the resource-intensive and high-impact sectors.

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<sup>4</sup> To contribute to the 2050 goal of reducing greenhouse gas emissions in the Union by 80-95 % compared to 1990



## 3. Key findings in a nutshell

### 3.1. Deep renovation is not happening at the required pace

More than 75% of Europe's housing stock is inefficient, and renovation rates remain low (around 1% in Europe on average). Where renovations do take place, they are often shallow, comprising of only one or two measures, with relatively low impact on building performance.

This very low uptake of deep renovation has been verified through an in-depth study on the renovated housing stock in France. Data regarding more than 250 renovated dwellings (mostly single-family houses) were extracted from several national databases. More than half of the renovations involved the implementation of a single measure (insulation of attics in most cases), and less than 20 cases involved more than 3 measures – as detailed below.

Table 1: Refurbishment packages implemented in the 262 studied cases. Source: CSTB, 2019

Package reference	Package description	Number of cases
<b>RP00</b>	Single measure (window change or roof insulation)	161
<b>RP01</b>	Window change, facade and/or roof insulation	52
<b>RP01b</b>	Heating system, window change or roof insulation	29
<b>RP02</b>	Window change, roof, floor and facade insulation	6
<b>RP03</b>	Heating system, window change, ventilation, and facade insulation	3
<b>RP04</b>	Heating system, window change, ventilation, roof and facade insulation	6
<b>RP05</b>	Heating system, window change, ventilation, roof and floor and facade insulation	1
<b>RP06</b>	Heating system, solar domestic hot water, window change, ventilation, roof and floor and facade insulation	4
<b>Total</b>		<b>262</b>

For the studied houses, average renovation costs ranged from 120€/m<sup>2</sup> for a single measure to 420€/m<sup>2</sup> for RP06 (with a global average of 140€/m<sup>2</sup> for the surveyed sample). The average computed<sup>5</sup> payback time is 16 years (90% of the cases being shallow renovations), ranging from 14 for the older buildings to 21 years for those built after 2000, as illustrated in Figure 1.

Additional cases from other EU countries and for other building types (multi-apartment buildings, public and tertiary buildings) were also studied however given the small size of the sample, it was difficult to draw any statistical conclusion (some of them are nevertheless presented as case studies on the Renovation Hub). Accessing and exploiting EU-wide data indeed proved more complex than initially expected for the following reasons:

- Multiplicity of databases which hampers their visibility
- Often confidential or difficult to access
- Non-homogeneity of data from one database to another

<sup>5</sup> The calculation of these indicators is based on the Energy Performance Certificates of the renovated houses, i.e. estimated EPC rating before and after renovation, hence an important margin of error.



- Databases available on public websites only present exemplary operations / showcases that are not representative of the market
- Unreliable energy data (in France, some of the database only provide energy consumption based on the Energy Performance Certificate, which induces a large margin of error; as for other EU databases, it is not always clear whether they use primary or final energy)
- Difficulties related to the recording of several operations carried out on the same building but at different times

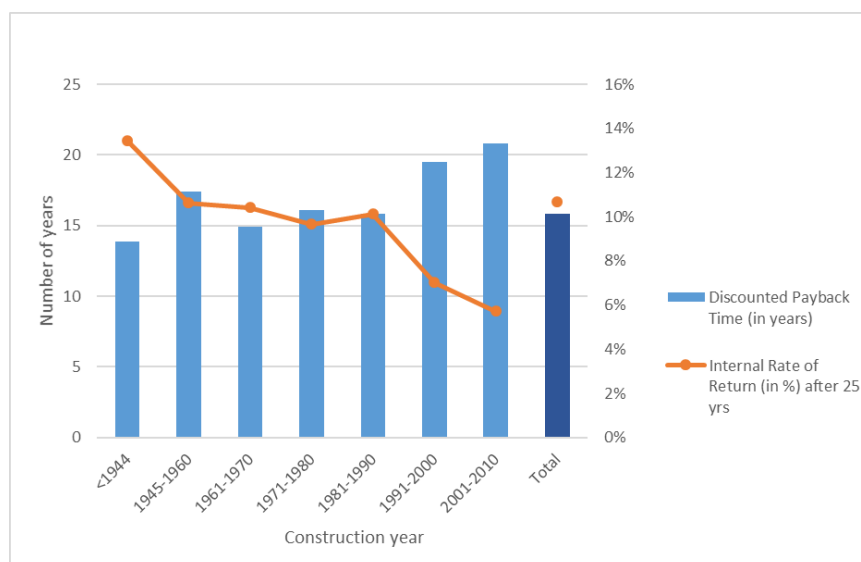


Figure 1: Average payback time and internal rate of return of renovations carried out in France for single family houses

## Main takeaways

- **On the renovation process itself:** Shallow renovation with the implementation of a single measure dominates the market. In order to avoid losing opportunities, this type of renovation process should be better guided in order to prepare the implementation of additional measures (thanks to a Step by Step approach)
  - [See for instance iBRoad project<sup>6</sup>](#)
- **On building renovation databases<sup>7</sup>:**
  - Centralised national online renovation observatories, providing easy access to anonymized database, should be set up
  - These databases should provide clear indication of the final (not primary) energy before / after renovation (in kWh/m<sup>2</sup>.year and not in terms of energy class)
  - They should also be compatible with building's renovation passports ("Energy Performance Certificates 2.0")
  - [See BPIE study on Building Renovation Passport<sup>8</sup> and ongoing feasibility study on article 19a of the EPBD<sup>9</sup>](#)

<sup>6</sup> <https://ibroad-project.eu>

<sup>7</sup> See more details in Annex 6

<sup>8</sup> <http://bpie.eu/publication/building-renovation-passports-consumers-journey-to-a-better-home/>

<sup>9</sup> <https://renovation.epbd19a.eu/>



## 3.2. Barriers to renovation

This paragraph presents an overview of the main results of the investigation relative to barriers that impede the renovation market, combining the project findings with feedback obtained during STUNNING Final Event. Business models that allow to overcome those barriers are also presented, as well as potential solutions or changes to be implemented in order to adapt those business models or operating procedures to the remaining hurdles they are most affected by.

### 3.2.1. Main barriers

The main barriers have been identified through surveys, direct stakeholder interactions and case studies.

#### Surveys

Through the surveys, we are able to rank the main barrier typologies from most to least significant along with the main identified barriers in each typology listed below:

1. Informational barriers
  - a. Difficulties in convincing end users of the benefits of deep renovations
  - b. Difficulties in conveying non-energy benefits
2. Financial barriers
  - a. Building owners' insufficient budget
  - b. Limited ability for small size ESCOs to offer financing options and limited involvement of third party financiers
  - c. Limited impact of energy performance certificates improvements on property value
3. Regulatory barriers
  - a. Limited government subsidies and programs
4. Technical barriers
  - a. Performance gaps
  - b. Need for solutions shortening renovation times
5. Structural barriers
  - a. Difficulties in coordinating stakeholders
  - b. Insufficient resources on part of SMEs for public tendering

#### Direct stakeholder interactions and case studies

Insights from direct stakeholder interaction and case studies tend to align directly to the survey results especially in terms of the most significant barriers for each typology. **Regulatory barriers are more preponderant** in the survey results. Specifically, in various cases, market actors have noted the difficulty in adapting their business models and approaches to varying regulation and policies that pertain to energy efficient renovations. This is even more so the case for SMEs who do not have as many resources to adapt.

### 3.2.2. How market barriers impact business models

One Stop Shops and Energy Performance Contracting (EPC) were identified as the most promising business models to accelerate the renovation of the building stock. As presented in STUNNING final publication, OSS can take various forms, and will benefit from a combination with other types of business models providing smart financing or new revenue schemes (see also section 3.3).





### 3.2.2.1. Business models based on One Stop Shops (OSS)

From a general point of view one stop shop business models can be efficient at overcoming the following set of barriers under certain conditions:

- Building owners' insufficient budget: Compared to successive interventions performed by different construction companies, one stop shops with one shot intervention are said to cost in total 30% less. This is however counter balanced by the fact that despite being less capital intensive on a holistic basis, it implies paying for multiple solutions in one go hence higher capital requirements at initial stages.
- Performance gaps and need for solutions shortening renovation times: Generally speaking, in one stop shops stakeholders work closer together leveraging all of the technical resources of each partner and with higher degrees of coordination and synergies in the installed equipment leading to more effective solutions from a technical point of view (no over sizing, no conflicts of interest, each expert makes the appropriate choice of systems and materials according to what other experts are doing)
- Informative (energy based benefits): Unique point of access for building owners.
- Difficulties in coordinating stakeholders: OSSs imply already formed teams of stakeholders and SMEs with pre-contractual agreements and experience.
- Limited ability for small size ESCOs to offer financing options and limited involvement of third party financiers and insufficient resources on part of SMEs for public tendering: OSS should enable groups of stakeholders to pool their resources (financial, technical, managerial) and alleviate these barriers.

They can be affected by the following barriers:

- Building owners' insufficient budget: As mentioned before OSSs often involve higher initial capital requirements compared to unstructured sequential refurbishments. Combining them with third party financing (TPF) is therefore crucial.
- Informative: Currently, most OSSs are putting forth information that is almost exclusively related to energy savings and costs and less about other potential benefits.
- Regulatory: regulatory volatility may be hard for group of multiple stakeholders with set solutions to overcome in a coordinated fashion compared to individually.

During the final event many of the above observations were confirmed by stakeholder experience.

#### Main takeaways and workshop feedback

OSSs were identified as one of the most efficient models for bringing renovations to market but recommendations and guiding principles should be respected:

- In order to properly address informative barriers, **one stop shops should have one main identifiable stakeholder working as a liaison between building owners and other market actors in order to appropriately centralize communications** and not have diffuse interactions. This interaction should be performed under the premises of the **Building Renovation Passport**.
- This main identifiable stakeholder can be provided by different types of organisations, including:
  - o **A bespoke entity**, for instance a semi-public company created for that purpose
  - o **Utilities**: placing the utility at the centre of the renovation process was seen as an efficient way to implement renovations as incentives for renovating could be shifted on these stakeholders while also enabling them to offer new services which can compensate for the lesser amounts of kWh sold. For instance, offering a fixed cost for energy supply at a fixed level of comfort with the possibility to refurbish customers' home for increased margins.
  - o **Insurances**
  - o **Cluster of SMEs** (which should be encouraged the development and promotion of a specific contractual form enabling a smooth delivery by the SME cluster – see for instance the French initiative [DORéMi](#))



- **Savings based financing options** or other such approaches should be made possible. (i.e. Energiesprong)
- It is clear that there is still a **great deal of uncertainty as to what motivates building owners to renovate**. Many stakeholders from the workshop note that **building owners are often more interested in the quality of life renovations might bring to them from a comfort, health, non-energy and non-financial perspective incl. (accessibility, aesthetics) than energy savings**. On the other hand, any form of risk perception related to energy renovation will be magnified and lead to inaction. Efforts should be dedicated towards **deeper understanding of the motivations of home and building owners** and then **focusing communication and information on the basis of these results**. The development and roll-out of specific methodologies that can **value in economic terms the non-energy advantages** (e.g. comfort, health, property green value, etc.) shall be encouraged to provide additional evidence to the end-users as well as financial institutions, to further de-risk the investment.

### 3.2.2.2. ESCO models - EPC

From a general point of view, Energy Performance Contracting business models can be efficient at overcoming the following set of barriers under certain conditions:

- Building owners' insufficient budget: As mentioned in takeaways for OSSs, building owners' utility curves seem to be loss averse favouring low risk investments in the realm of EE renovations. As EPC's transfer risks, this is a good approach to nullifying issues around insufficient budgets and loss aversion. When the ESCO is the borrower, the customer is safeguarded from financial risks related to the project technical performance because the savings guarantee provided by the ESCO is either coming from the project value itself or is appearing on the balance sheet of the ESCO; hence the debt resides on someone else's balance list as the ESCO collateralizes the loan with anticipated savings payments from the customer. In this scenario performance risk and business risk is assumed by the ESCO.

They can be affected by the following barriers:

- Limited ability for small size ESCOs to offer financing options and limited involvement of third party financiers and insufficient resources on part of SMEs: EPCs are most frequently found in the public sector and to a lesser extent in the industrial and commercial building sectors. Therefore, the players that have the best chances, resources and capacities for operating with these business models are large players.

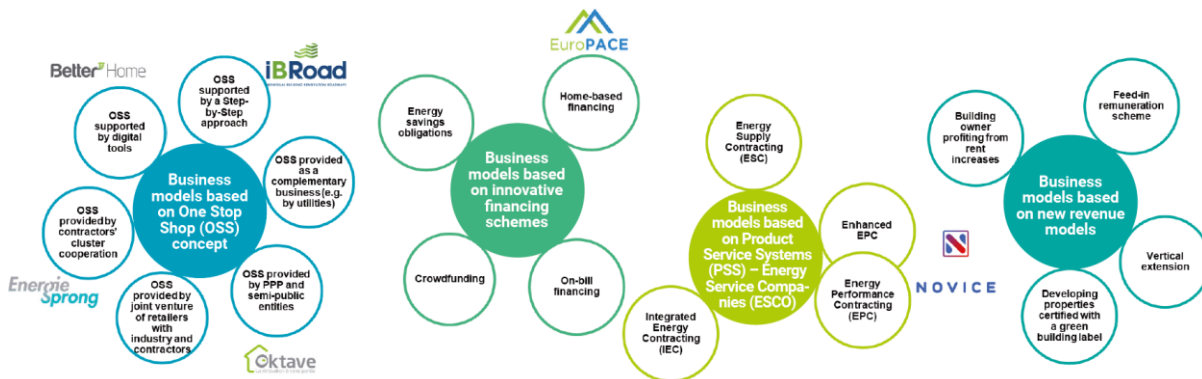
### Main takeaways and workshop feedback

As borrowing for ESCOs requires more than just savings requirements but also collateral and credit history it is clear that **SMEs and small structures with scarce resources will most likely perceive barriers. This clearly hinders the market as a whole since ESCOs financing EPCs through TPFs could impose itself as a solution to the insufficient budgets of stakeholders of not just large projects**; for instance housing operators that have limited possibilities or inclinations for obtaining TPF financing themselves and offer lower scale projects that are of little interest to larger ESCOs with funding capacity.



### 3.3. Promising business models

In STUNNING, a structured Business Models Database has been created to collect data on business models so as to define BMs clusters. This enabled the identification of four main families of BMs (and related sub-categories of business models), as illustrated below. Real business models are often a combination of several business model patterns, and BM families should not be considered in isolation: on the contrary, combining several patterns can provide a more robust business model.



The objective of the table below is to summarise the large collection of existing business models and suggest “recipes” for each building type. Recommendations for replication are provided next page.

For who?		The problem	What? Recommended Business Model	How?	Can be combined with	Where? (Example of countries with high potential for this BM)
Type of dwelling	Type of owner					
	Owner occupant	Renovation journey too costly and complex for the home owner	One Stop Shop	provided by PPP / semi-public entities supported by a digital tool	- Step by Step approach - Home-based financing	Countries with incentives for home owners to renovate Denmark, Germany
	Social housing	Renovation in occupied dwellings. Acceptance by tenants	One-Stop-Shop “Energiesprong”	Initiated by a dedicated marketing team	Add-on business model	Netherland, Denmark, Germany, UK
			Energy Performance Contracting	Provided by an ESCO	Collective Self Consumption	France, Denmark
	Condominiums	Renovation in occupied dwellings. Acceptance by multiple owners.	One Stop Shop	provided by PPP / semi-public entities	Step by Step approach	Germany, France, Denmark
	Public buildings	Upfront investment. Long term estate management	Energy Performance Contracting	Provided by an ESCO	Crowdfunding (for cultural heritage)	France, Denmark
	Offices and other tertiary buildings	Attractivity of estates for companies / lessees	Energy Performance Contracting	Provided by an ESCO	- Demand Response services - Higher rents - Green label	France, Denmark

**Other interesting Business Models:****Other One-Stop-Shops**

- [OSS provided as a complementary business \(e.g. by utilities, insurances\)](#)
- [OSS provided by joint venture of retailers with industry and contractors](#)
- [OSS provided by SME contractors' cluster cooperation](#)

**Energy as a service:**

- [Energy Supply Contracting \(ESC\)](#)
- [Integrated Energy Contracting \(IEC\)](#)

**New revenue models and financing schemes**

- [Feed-in remuneration scheme](#)
- [On-bill financing](#)
- [Leasing of renewable energy equipment](#)
- [Energy savings obligations](#)

More information about all the business models can be found in the [Renovation Hub](#) and in STUNNING final publication.

## Recommendations when setting up a new renovation service

**WHAT (Value proposition):**

- Address key selling points for the end-customer: **accessibility, comfort, status/ reputation** – energy efficiency comes on top. Put forward the global comfort and go beyond the energy performance
- Create **trust** and **simplify the customer journey** (e.g. with One Stop Shops, renovation coordinators / coaches, main contractor, etc.)
- Build confidence from clients thanks to **performance guarantee**

**WHO (customer segment and customer channels):**

- When setting up a renovation service, identify **subsegments and what triggers renovation for each of them** (i.e. purchase of a new house) and develop a new (local) business model around that (with synchronisation of incentives)
- **Communication is key: tailor the messages to the targets**. Support **local peer-to-peer learning**
- Use **influencers** to speed up the changes

**HOW (Key activities & resources, key partnerships):**

- Focus on the **integration of all actors** and integrate the local market
- Build national synergies and alliances, engage with local stakeholders
- Dedicate resources to the **training & upskilling of contractors & installers** (including digitalisation), with a systemic approach to ensure that the overall performance (energy, comfort, etc.) is well accounted for and that the different trades collaborate more efficiently

**WHY (Revenue model):**

- Convince bank and financial institutions to **think in net present value, well-being instead of payback**
- Compare the investment cost with the cost of doing nothing (Business as Usual) – **implement risk management in business models**
- If not already done and if possible, set up **incentives** to encourage deep renovation – including staged incentives to better support Step-by-Step approaches
- More specifically with regard to **procurement** processes:
  - o Encourage long-term partnerships (not on a project basis)
  - o Support innovation to accelerate its uptake (in particular for central governments) – see EU guidelines on Public Procurement of Innovation





## 4. Summary of feedback received during the project

Within STUNNING, a lot of effort has been dedicated by the project partners to raise awareness on success stories and promising business models for deep renovation, which should be replicated at large scale in order to increase the renovation rate.

Different channels have been used to support this goal and go beyond the circle of “EU-aware stakeholders” (i.e. persons and organisations already involved in EU projects):

- Digital means: articles on the Renovation Hub, social media (Twitter, LinkedIn)
- Printed documents: final publication
- Workshops
- Webinars
- Final event with collaborative workshop

Most of the activities have been centred around the Renovation Hub. Developing this platform had been decided at proposal stage, in order to have a central place fully dedicated to the energy renovation topic, where the consortium could share the generated knowledge in a packaged way. Existing EU platforms such as BuildUp or Construction 21 would not have allowed this freedom of designing and organising the different articles for an enhanced readability and visibility during the project.

Among the various feedback received from the different stakeholders who were contacted or encountered in the process of promoting novel business models, the following points are of interest:

### ***With regard to refurbishment packages and business models for deep renovation:***

- Focussing on energy efficiency and payback is not a sellable concept. An **integrated, user-centred and service-based approach** including both technological solutions and the corresponding business model needs to be implemented to scale up the energy retrofit market.
- Solutions should be deployed in a **packaged and holistic way with a whole house refurbishment concept** including improvement of comfort and **well-being** (e.g. where relevant refurbishment of kitchen and bathroom, building extension).
- Energy efficiency is not what triggers the decision but should facilitate the financing thanks to initiatives such as **green mortgages** and **de-risking**.
- There is a strong interest in **One Stop Shop** approaches.

### ***With regard to tools and events:***

- The interest for a **common (and sustainable) platform** benchmarking refurbishment packages and presenting business models and case studies from all over Europe in a single place and in an homogeneous way was highlighted by several types of stakeholders (industry, policy, research communities). However the multiplicity of already existing platforms (BuildUp, Construction 21, DEEP-EFIG, SCIS, etc.) was also noted. It was finally underlined that in order to have an EU wide outreach with a larger audience, a portal offering **country-specific sub-pages** would be instrumental.
- **Clustering events and workshops** should be organised regularly to enable projects addressing renovation to share lessons learnt and good practices, and discuss cross-cutting issues.



## 5. Conclusions

There is no one fit-for-all business model for the energy efficient renovation of buildings, but a variety of possible combinations. In order to efficiently support the deep renovation of buildings, the best “recipe” should take inspiration from successful business models already piloted and replicated in Europe, but also pay attention to local constraints, barriers and enablers (in terms of regulations and policies, building type, type of ownership, climate, local value chain).

STUNNING has made a first attempt to provide a clear classification of existing and promising business models that can be used as building blocks for new renovation services, and provided recommendations on how to implement them (based on the analysis of case studies). Substantial effort was then made towards the promotion of these business models, through workshops, webinars, a final event and the Renovation Hub in particular (which has 150 registered stakeholders – as of 07/11/19).

The objective of this policy brief was to summarise the recommendations and key takeaways gathered during the project. More detailed information on the work carried out by the consortium can be found in the project deliverables, in the final publication and the Renovation Hub.



## 6. Annex – further recommendations on databases

**Data are key** to provide sound and robust information on the cost-efficiency of deep renovation so as to **de-risk investments** and **accelerate the transition** towards an energy efficient building stock. Centralised national and EU online renovation observatories, providing easy access to anonymized database, should be set up, with the following recommendations:

- **Reinforce the EU Building Stock Observatory**, aggregating data at NUTS 2 level when possible (rather than country level only)
- **Populate this observatory with data from national databases** (at least from their databases centralising energy performance certificates, when they exist)
- **Require that Member States set up national renovation observatories**, to enable the calculation of key indicators on the depth and cost-efficiency of implemented renovation works, and to monitor the progress on their long-term renovation strategies.

These national observatories should at least contain the following information:

- Surface of dwelling/building
- Type of building (residential, offices, etc.)
- Type of ownership
- Date of construction
- Date of renovation
- Place (at least with NUTS 2 or NUTS 3 code)
- Performance before (in kWh/m<sup>2</sup>. year, not only in terms of EPC rating)
- Performance after (in kWh/m<sup>2</sup>. year, not only in terms of EPC rating)
- Energy gain (kWh/m<sup>2</sup>.year)
- Implemented solutions
- Cost of renovation
- Energy carrier used for heating (before / after)
- Incentives received (with details of the different funding instruments)

When setting up these observatories, specific attention should be paid to:

- The **type of energy used** to define the performance before and after: when collecting data a lot of confusion has been detected in the different databases between primary energy and final energy. Although primary energy is the most commonly used today (e.g. Energy Performance Certificates are based in Primary Energy), it is not the most straightforward to calculate the cost-efficiency of renovation. Furthermore it is based on the use of Primary Energy Factors that evolve with time (sometimes with a rather political dimension), which generates a bias for analyses based on the aggregation of large datasets.
- The **completeness and quality** of the provided data
- The way step by step renovations are accounted for. With regard to this specific point, the development of **digital building renovation passports** and their centralization in a national system would bring a substantial added value. These building renovation passports could also provide data on real operation and maintenance costs which would be invaluable to fine-tune cost-benefit analyses

