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*Review of building renovation passport schemes
and initiatives*

Final report

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Technical coordinator	Peter Wouters, <i>INIVE</i>
Authors	Jonathan Volt & Mariangiola Fabbri, <i>BPIE</i>
Contributors	Martin Pehnt & Mandy Werle, <i>ifeu</i> Jean-Noël Geist, <i>THE SHIFT PROJECT</i> Remi Babut, <i>P2E</i> Marion Jammet, <i>Irish Green Building Council</i> Tine Vande Castele & Roel Vermeiren, <i>VEA</i> Cécile Andicochea, Gilles Guerrin & Valérie Sabéran, <i>Bordeaux Metropole</i> Nils Kaare Bruun, <i>BetterHome</i> Matthieu Flahaut, <i>Oktave</i> Rui Fragoso, <i>Certificação Energética dos Edifícios</i> Perrine Gross, <i>Alec49</i> Sebastian Metzger & Nadine Walikewitz, <i>co2online</i> Alice Morcrette, <i>SPEE Picardie</i>
Reviewers	Oliver Rapf, Marine Faber & Margaux Barrett, <i>BPIE</i> Barney Jeffries, <i>ngo.media</i> Marianna Papaglastra, <i>just-pm</i>
Project website	epbd19a.eu

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Contents

Glossary	5
Introduction	6
Methodology	6
Identification of schemes and initiatives	6
Evaluation of the schemes and initiatives	7
Selection of deep dives	8
Deep dives	9
[1] BetterHome	9
Key results	10
[2] Certificação Energética dos Edifícios	11
Key results	12
[3] Det digitale energimærke	13
Key results	14
[4] Energieberatung	15
Key results	16
[5] EPC+ & Woningpas	17
Key results	18
[6] HeizCheck	19
Key results	20
[7] Home Energy Masterplan	21
[8] Individueller Sanierungsfahrplan & [15] Sanierungsfahrplan BW	23
Key results	25
[9] Ma Rénov	26
Key results	27
[10] Oktave	28
Key results	29
[11] Passeport Efficacité Énergétique & [12] Passeport Energie Habitat	30
Key results	31
[13] Picardie Pass Rénovation	32
Key results	33
[14] Rénoclimat	34
Key results	35
[16] Superhomes	36
Key results	37
Conclusion	38
References	41
Annex 1: Overview of the schemes and initiatives	43



Glossary

Energy audit – An assessment of the energy needs and efficiency of a building, conducted by an energy expert.

Energy performance certificate (EPC) – An EPC is a rating scheme indicating the energy performance of a building in the European Union. Each Member State (and, in certain cases, region) has developed its own EPC framework according to the framework given by the EPBD [2010/31/EU – Article 2 (12)].

Energy Performance of Buildings Directive (EPBD) – The objective of this Directive [2010/31/EU] is to promote the improvement of the energy performance of buildings within the Community, taking into account outdoor climatic and local conditions, as well as indoor climate requirements and cost-effectiveness. The EPBD was amended [by way of Directive 2018/844/EU] in 2018.

Individueller sanierungsfahrplan (iSFP) – One of the first examples of building renovation passport, developed by the German federal government providing a renovation roadmap for single family buildings.

Indoor environmental quality (IEQ) – IEQ is a general indicator of the quality conditions inside a building. It most commonly refers to indoor air quality, thermal comfort, aesthetics, ergonomics, biophilia, acoustics and lighting. Several of these elements have a significant impact on our health, comfort and productivity¹.

Logbook – A (digital) repository where all building information can be stored and continuously updated².

Long-term renovation strategies – These strategies must be established and implemented by Member States pursuant to Article 2a of the EPBD to support the renovation of the national stock of buildings into a highly efficient and decarbonised building stock by 2050, and will form part of Member States' integrated National Energy and Climate Plans.

Minimum Energy Efficiency Standards (MEES) – A renovation obligation depending on the energy rating of a building (such as primary energy demand). If the performance doesn't meet the minimum standards, the building must undergo a renovation.

One-stop-shop – An advisory service for building owners, compiling all information related to the renovation process and facilitating the contact with contractors and installers³

Passeport efficacité énergétique (P2E) – One of the first BRP, developed and implemented in France

Sanierungsfahrplan Baden-Württemberg (SFP BW) – A German renovation roadmap in the region of Baden-Württemberg.

¹ See for example the Buildings 2030's (2018) *Building 4 People* study and BPIE's (2018) *The inner value of a building*.

² See for example iBRoad (2018) *The logbook data quest*.

³ See for example JRC (2018) *One-stop-shops for energy renovations of buildings*.



Introduction

This study is commissioned and supervised by the European Commission's (EC) Directorate-General for Energy (DG ENER) and intends to provide technical support to investigate the feasibility of introducing optional building renovation passports (BRP) in the EU. In particular, pursuant to Article 19a of the Energy Performance of Buildings Directive (EPBD), this study evaluates the relevance, feasibility and potential impact of BRPs based on a number of aspects. This work is carried out in close consultation with stakeholders and in collaboration with leading experts, including IFEU and the Shift Project.

This first report provides information on the most relevant existing schemes and initiatives. First section outlines the methodology and background for analysing the cases and for selecting cases for further analysis (i.e. deep dives). These deep dives are presented in the [following chapter](#), which includes a description of the model, key features and relevant results. The [final chapter](#) concludes the main findings of the review.



Methodology

There is no universally agreed definition of a building renovation passport and its meaning and purpose overlaps with other instruments. The BRP is generally considered as an instrument that can stimulate cost-effective renovation in the form of a "long-term, step-by-step deep renovation roadmap for a specific building based on quality criteria, following an energy audit, and outlining relevant measures and renovations that could improve the energy performance" [EPBD 2018/844/EU]. The stakeholder involvement process of this project will further discuss the BRP definition.

The review presented in this report comprises BRP schemes that largely correspond to the above definition, including the German federal renovation roadmap ([individueller sanierungsfahrplan](#)) and the Flemish roadmap and logbook (EPC+ and [Woningpas](#)). The review does also include schemes and initiatives that share some characteristics and objectives with the BRP, including one-stop-shops, energy performance certificates, energy audit frameworks and online renovation advice tools.

Identification of schemes and initiatives

The selection of cases follows a three-step approach:

- 1) Define the intended outcomes of the concept**
The first step is to outline what the concept could contribute with, such as providing better renovation guidance or aligning financial support for deep renovations. The intended outcomes were agreed together with the European Commission and supported by the stakeholder input.
- 2) Classify the indicators needed to evaluate the relevant initiatives**
Based on the defined outcomes, we identify observable and measurable characteristics that can be used to evaluate how the scheme is contributing to achieving a specific outcome.
- 3) Identify and select relevant schemes and initiatives**
The last step was to identify the most relevant schemes and initiatives.

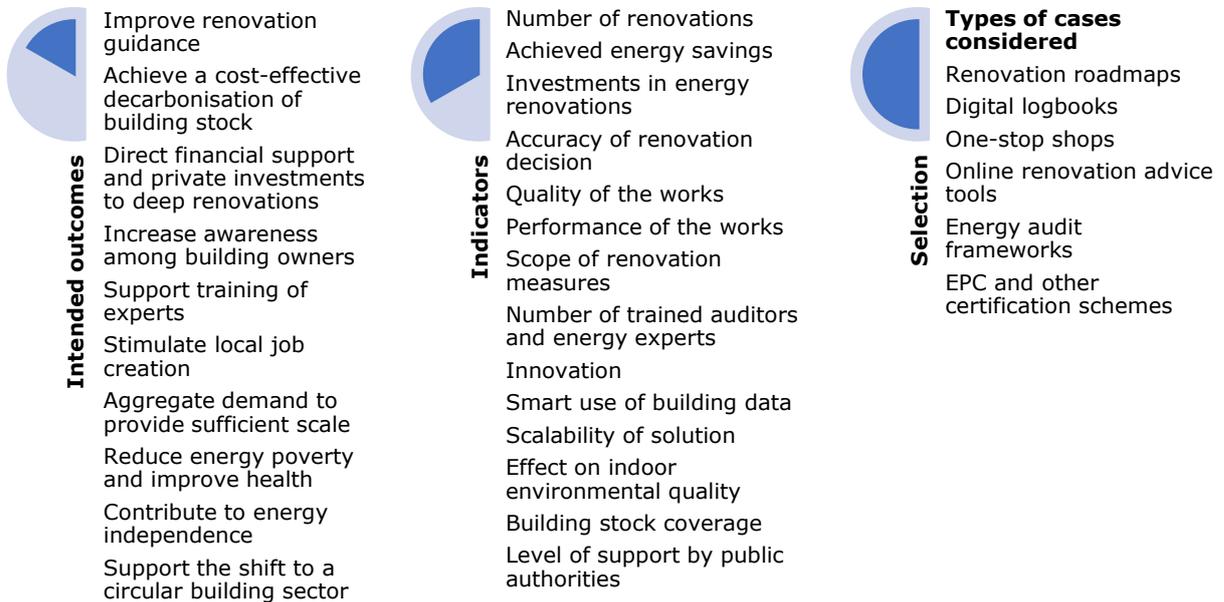


Figure 1: The three-step selection process

The required information was gathered through desk research⁴, interviews with experts and stakeholder input.

Evaluation of the schemes and initiatives

Each case on the primary list, which includes 33 schemes and initiatives, are scanned and assessed on how well they fulfil the identified indicators (second column presented in Figure 1). For each indicator, the case was given a rating (from 0 to 3 points) based on how well it fulfils this indicator (see criteria in Figure 2)⁵. The evaluation was based on expert input, interviews and accessible data.

0	No impact/potential
1	Minor impact/potential
2	Significant impact/potential
3	High impact/potential

Figure 2: Rating criteria

Out of 33 cases, 27 reached a total score of 26 or higher, indicating that most of the schemes are having, or could have, a significant impact. The indicators with the highest average score are “scalability of solution”, “building stock coverage” and “scope of renovation measures”, while the “effect on indoor environmental quality” is being neglected in many of the cases.

⁴ The research covered available studies on this topic, especially reports from the European Commission’s Joint Research Centre, National Renovation Strategies, and compilations and analyses made by Energy-cities, Covenant of Mayors and BPIE.

⁵ Three indicators – i) number of renovations, ii) quality of the works and iii) scalability of the solution – we considered as the most important indicators and was weighted higher than the rest. The three indicators were deemed as crucial and was given a weight 2 (i.e. the rating is multiplied with two for these indicators). The weighting did, however, not influence the final selection of cases.



Selection of deep dives

The selection of the deep dives is based on the rating of cases. Fifteen of the selected cases are the highest ranked, while the sixteenth (an online renovation advice tool) is included to add diversity.

Table 1: Description of the cases selected for deep dives

Number of deep dives	16
Geographical spread	8 countries (7 European countries + Canada)
Types of cases	6 one-stop-shops 6 building renovation passports 2 energy performance certification schemes 1 energy audit framework 1 online application
Level of governance	8 regional, 4 national and 4 privately governed schemes

The selected schemes and initiatives are presented in Table 2 and the full primary list is presented in Annex 1 (on page 43). Please note that the cases are described in alphabetical order.

Table 2: Selected deep dives⁶

1	BetterHome	DK	One-stop-shop
2	Certificação Energética dos Edifícios	PT	Energy performance certificate
3	Det digitale energimærke	DK	Energy performance certificate
4	Energieberatung	DE	Energy audit framework
5	EPC+ & Woningpas	BE	Building renovation passport
6	HeizCheck	DE	Online renovation advice tool
7	Home Energy Masterplan	UK	Building renovation passport
8	Individueller Sanierungsfahrplan für Wohngebäude	DE	Building renovation passport
9	Ma Rénov	FR	One-stop-shop
10	Oktave	FR	One-stop-shop
11	Passeport Efficacité Energétique	FR	Building renovation passport
12	Passeport Energie Habitat	FR	Building renovation passport
13	Picardie Pass Rénovation	FR	One-stop-shop
14	Rénoclimat	CAN	One-stop-shop
15	Sanierungsfahrplan BW	DE	Building renovation passport
16	Superhomes	IE	One-stop-shop

The research of existing schemes and initiatives have resulted in much more information and evidence than what is possible to include in this report. The consortium has compiled further information in a BRP case registry that will be used to provide additional context when outlining policy packages (task 5) and assessing their impact (task 6). The registry is shared with the European Commission for consultation.

⁶ The two German renovation roadmaps (sanierungsfahrplans) are presented together, as the regional case inspired the national one and, as a result, they have several similarities. The same goes for the French Passeport Efficacité Energétique (P2E) and Le Passeport Energie Habitat (PEH), as their definitions of the BRP are very similar.



Deep dives

The schemes and initiatives described in this section are considered the most relevant for the purposes of this study. Each case is briefly described, including relevant political and financial contexts when relevant. If accessible, we include some key evidence used to estimate the impact of the respective scheme, including aspects such as average energy saving per project and user survey results. The evidence and rating will feed into the forthcoming impact assessment and should be seen in the light of this.

[1] BetterHome



BRP characteristics: *tailored renovation advice, on-site check, smart data solution*

BetterHome is an industry-driven one-stop-shop model. Since it was launched in Denmark in 2014, it has proven successful in increasing demand for deep energy renovations. The model reduces the burden on the building owner by streamlining the renovation process [1].

BetterHome partners with other players in the construction value chain, including financial institutions providing mortgages, utility companies with energy saving obligations, local governments, real-estate agencies as well as building professionals and installers, in order to deliver a comprehensive one-stop-shop solution. In this service-oriented model, homeowners are offered tailor-made solutions based on their specific preferences, covering energy improvements on the building envelope and heating, cooling, ventilation and hot water systems inside the building. The process is holistically planned, optimising the value chain by minimising efficiency losses and miscommunication issues and avoiding lock-in effects [1].

A single installer is responsible for the whole renovation process and coordinates with the other installers involved in the renovation of the same property, allowing for better planning and building trust with the homeowner. The involved expert can also share relevant information on the renovation project via BetterHome's digital platform, creating a leaner process [1]. The solution also simplifies the work for the energy expert by providing online checklists and forms, while enabling a better customer relationship. BetterHome trains and guides the energy expert on how to approach the homeowner, from the first contact to the finalisation of the process [1].

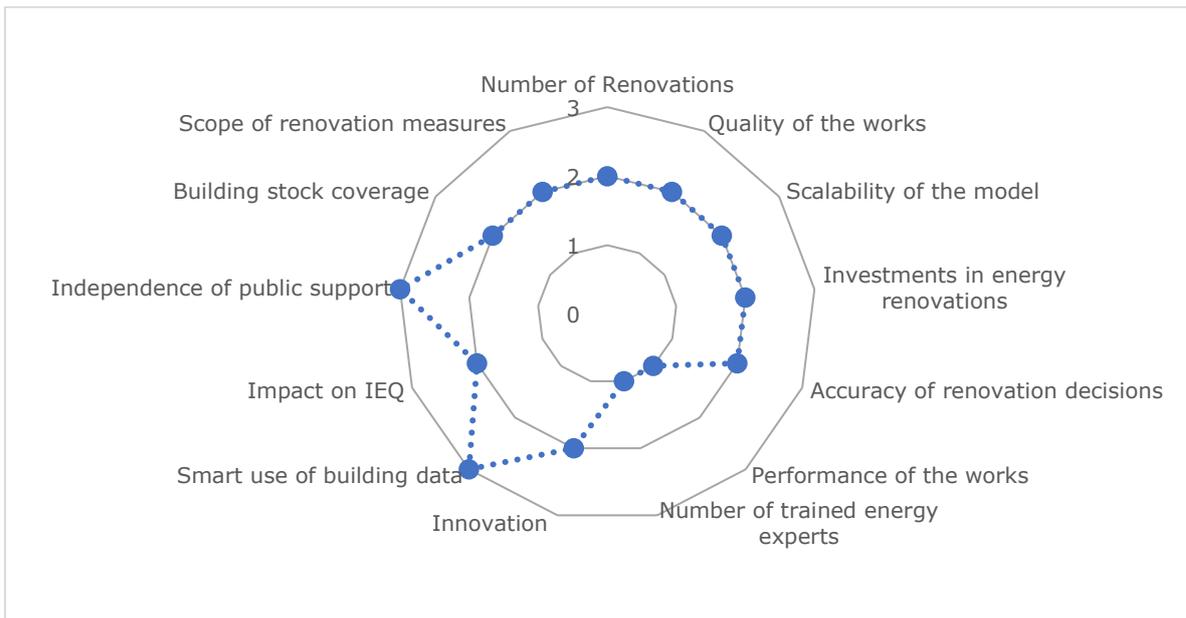


Figure 3: Betterhome - rating per indicator



Key results

- Mainly deep renovation projects, with investments of ~ €70 000 [1]
- Energy savings ranges from 30-70% [1]
- 200 projects per year (status in 2016) [1]



[2] Certificação Energética dos Edifícios



BRP characteristics: tailored renovation advice, on-site check, dynamic registry of buildings, integrates financial possibilities, monitor decarbonisation of building stock

The Portuguese energy performance certificate (EPC) scheme is one of the European frontrunners, with a publicly available database of more than 1.6 million EPCs. The national energy agency, **ADENE**, is responsible for the design and implementation of the framework, as well as of the EPC registry. Around 2,000 auditors are authorised to issue EPCs and ADENE estimates that over 2 million energy saving measures have been identified within the framework [2].

The EPC database is structured into eight main sections: (1) geographic information, (2) building identification, (3) building characterisation, (4) envelope, (5) ventilation, (6) technical systems, (7) energy balance indicator, and (8) improvement measures. For each section, there are several variables based on which the EPC is evaluated and categorised. The public authorities use the EPC registry to evaluate the building stock, monitor the impact of policies, and predict the impact of future policies [3].

The design of the EPC is user-friendly and aims at alleviating the lack of awareness of energy efficiency in buildings, which is one of the main barriers to energy efficiency investments in Portugal [4]. The EPC comprises information on:

- The overall energy performance score and other general information, such as address, picture and size of the building.
- The quality of the envelope components based on a simple grading system, showing the grade of thermal insulation for walls, roofs, floors and windows.
- Illustration of the building's heat losses.
- A list of recommendations of potential measures selected by the energy expert from a predefined list and completed with open text. The EPC can display up to 10 potential measures with detailed information on the technical description, the necessary investment and the benefits coming from the implementation of each measure.
- A comparison of the building's performance with similar buildings on the market.

The EPC framework plays a vital role in the financial scheme IFRRU 2020, which supports investments in urban rehabilitation. In this scheme, the EPC data is used to evaluate the renovation needs, support the application process and monitor the financing programme [2].

ADENE is planning to link the EPC database with a public one-stop-shop, CasA+, which aims to fill the market gap between homeowners and solution-providers. The integrated model will connect homeowners, installers, energy experts, public authorities, insurance and financial institutions, and by doing so facilitate the uptake of renovation measures. One proposed feature is that the homeowner will be able to indicate what measures they are interested in implementing, and solution providers can submit offers for specific measures [2].

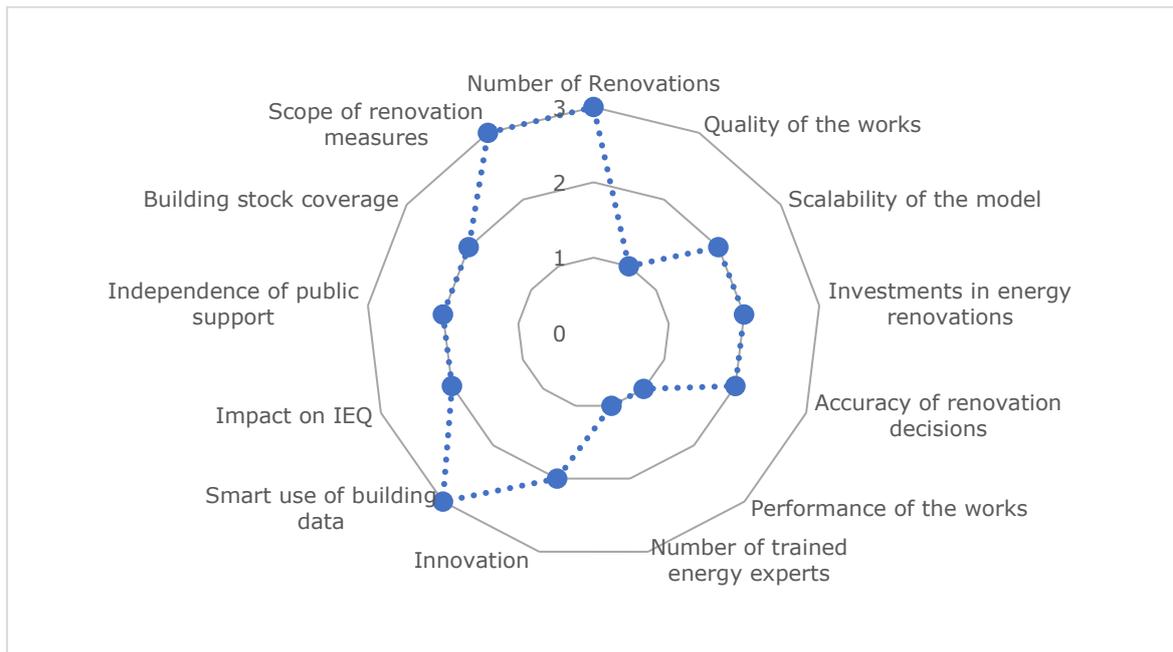


Figure 4: Certificação Energética dos Edifícios – rating per indicator



Key results

- An Ipsos survey on the potential of BRPs, conducted for the Horizon 2020 project iBRoad, shows that 47% of respondents in Portugal would trust the EPC for advice about renovation measures (compared to 17% and 18% in the other surveyed countries, Bulgaria and Poland) [4]
- In Portugal, almost three quarters (73%) of respondents think that there is more they could do to reduce the energy consumption in their home. Three out of five (61%) agree that their household's energy use can be reduced through renovation measures [4]
- 94% of house buyers consider energy efficiency to be an important aspect in their purchasing decision [4]
- When asked whether they would consider having an energy audit of the house/apartment they are about to buy, 78% said that they would. One in five homeowners (20%) said that they have had an energy audit of their home [4]
- The most cited items respondents wanted to see in a renovation roadmap were estimated costs of each renovation step (67%), expected benefits in terms of reduced heating/bills (60%) and technical information to help them avoid mistakes (56%) [4]
- According to the survey, the ideal timeframe for a renovation roadmap is five years [4]

[3] Det digitale energimærke



BRP characteristics: building data registry, tailored renovation advice, monitor decarbonisation of building stock

Denmark has one of Europe's most ambitious EPC schemes, with over 600,000 EPCs issued since it was launched in 1997. The information included in the EPC covers a brief description of potential renovation measures and an assessment of their estimated costs, savings, payback time and impact on the EPC rating. The recommendations are tailored to the specific building, but it is not specified in which order the measures ought to be installed [5].

In Denmark, all EPCs are registered in a publicly accessible database by the [Danish Energy Agency](#). The database includes detailed data for each building, including the EPC report. The database is dynamic as it allows users to easily compare their building with neighbours, or to the whole Danish building stock, and illustrates how much energy could be saved through various measures. The database also comprises a detailed EPC map showing the status of every building with an EPC. Users can also retrieve more detailed information, including on water supply and soil contamination but access must be granted first [6].

The Danish EPC database is one element of the [Danish strategy for energy renovation of buildings](#), which sets out how Denmark is planning to decarbonise its building stock. Several objectives are described as part of the government's approach to maintaining an effective and targeted energy certificate scheme for buildings. The database also enables public authorities and researchers to track energy demand and assess what impact energy renovation measures have⁷ [7].

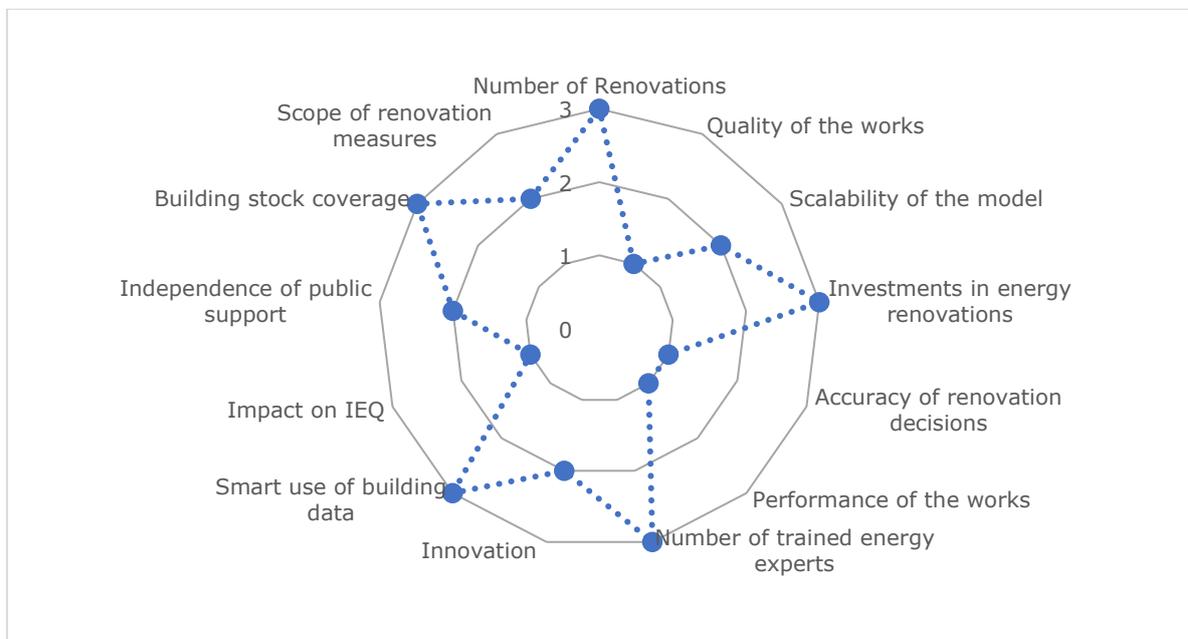


Figure 5: Det digitale energimærke – rating per indicator

⁷ One example is the analysis done by Wittchen & Kragh (2016), *Danish Building Typologies and Building Stock Analyses*.



Key results

- A survey of 1006 Danes who bought a property in 2015, shows that 65% stated that they read the whole report that comes with the EPC [8]
- 45% of owners are living in a building with a lower EPC rating (E-F-G) have implemented at least one of the EPC-listed energy-saving measures (for people living in D=35%, C=16%, B=15%, and A=7%) [8]
- When asked about the importance of the EPC when they bought their building, 22% described the EPC as very important, while 36% saw it as somewhat important [8]
- Most building owners were satisfied with an EPC rating C (37%), followed by D (22%). Only 7% desired an EPC rating A to be satisfied [8]
- 38% of the building owners implemented measures because it was “financially attractive”, while 28% did so in conjunction with other renovation work. Only 5% did so to reduce their climate and environmental impact [8]
- 46% of the building owners knew that it is possible to view their own or other EPCs online; while 46% out of these had used this function [8]
- 6% said they would have renovated if the EPC report included more detailed information and additional suggestions for renovation measure [8]
- The most commonly implemented measures from the recommendations related to windows (42%), roof (39%), heating system (28%), doors (21%) and external wall (19%) [8]

[4] Energieberatung



BRP characteristics: on-site audit, integrated with other instruments, tailored renovation advice

There is a long tradition of energy efficiency services in Germany, including energy audits and energy checks. Germany's framework of energy audits and checks goes far beyond the requirements in Article 8 of the [Energy Efficiency Directive](#), which addresses the requirements and promotion of energy audits for enterprises. The number of energy consultants in Germany is estimated to be between 12,500 and 13,500, of which around 3,800 are energy auditors [9].

In 2017, a federal individual renovation roadmap ("individueller Sanierungsfahrplan") was launched as an evolution of the on-site energy audit. The roadmap provides detailed step-by-step renovation guidance to the building owner of how the building can become a low-energy building (see more on page 23).

There are several schemes to support energy audits and checks in Germany, including:

- The 740 local consumer centres exist across the country to provide energy advice to private households, which [service](#) ranges from online and telephone consultations to on-site energy counselling.
- Consumer associations offer energy checks and carry out around 5,000 audits per year, while the federal BAFA support programme 'Vor-Ort-Beratung' offers energy audits to homeowners, delivering about 9,000 audits per year.
- The BAFA programme for non-residential buildings, "[Energieberatungen für Nichtwohngebäude](#)", offers support to municipalities. The energy consultancy provides a detailed renovation solution for the building, either as a step-by-step roadmap or a one-step renovation.

On behalf of the German government and the federal states, the KfW Development Bank provides a bundle of programmes, including subsidies and low-interest loans, to encourage energy renovation of buildings as well as the construction of new buildings with very low energy requirements. The [KfW schemes](#) are designed specifically to promote deep renovation following the motto: "The deeper the renovation, the higher the incentive". To illustrate this point, a grant of 30% is offered if the refurbishment reaches the most ambitious KfW Efficiency House 55 standard, while the slightly less ambitious level of KfW Efficiency House 70 attracts a lower grant of 25%.

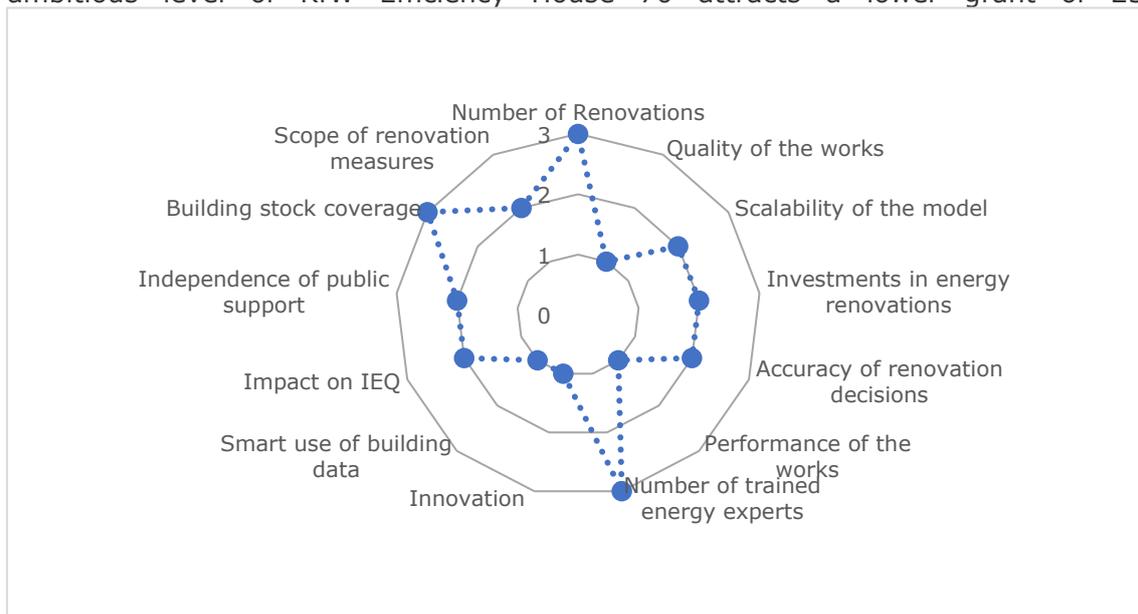


Figure 8 Energieberatung - rating per indicator



Key results

Energy checks/advice (Evaluation of "Energieeinsparberatung" and "Energie-Checks") [10]

- Between 2012 and 2015, an average of around 100,000 energy consultations were carried out under the projects Energieeinsparberatung and Energie-Checks
- 1 Euro of public funds spent on these programmes reduced energy consumption by 213 kWh (Energieeinsparberatung) and 118 kWh (Energie-Checks) on average
- 1 Euro of public funds spent triggered €14.63 (Energieeinsparberatung) and €6.04 (Energie-Checks) of private investments in energy-saving measures
- On average, 52% of building owners and 44% of tenants state that they have avoided bad investments thanks to the energy advice
- The energy advice has a positive effect on the performance of installed components; 3% thicker wall insulation, 20% thicker roof insulation, 13% thicker basement (geschossdecke) insulation. The basement ceiling insulation (kellerdecke) was 21% weaker on average, which is probably due to the low number of participants installing this measure
- 67% of recipients of energy advice chose A+++ products, compared to 47% of the control group

On-site audits (Energiesparberatung vor Ort) [11]

- 84% of the counselled homeowners said the audit increased their understanding of which measures are meaningful in the long term
- More than 90% of the surveyed building owners implemented, or "firmly planned", energy-saving measures after the audit
- Each on-site audit triggered an average gross investment of between €34,822 (2012) and €42,541 (2009)
- An additional renovation investment (carried out and planned) of around €6,600 for one- and two-family houses and €9,400 for multi-family houses was triggered per on-site audit
- Almost half (2012: 44%, 2009: 46%) of the building owners receiving an on-site audit were helped to avoid bad investments
- Available subsidy was the main reason (66%) for people to pursue an on-site audit

Energy audit for non-residential buildings (Energieberatung für Nichtwohngebäude) [12]

- 40% of the municipalities and non-profit organisations were interested in receiving advice on how to reach a low-energy building (i.e. KfW Efficiency House standard)
- 28% of the municipalities said that they would not have implemented any renovation measure if they had not received the energy advice
- Roughly 40% mentioned financial restrictions due to high investment costs as the reason they did not implement some of the measures
- 1 Euro of public funds spent on this programme reduced energy consumption by 14.29 kWh on average
- 1 tonne of CO₂ was reduced per €214 invested in the programme
- 1 Euro invested in the programme triggered additional investments of €31



[5] EPC+ & Woningpas



BRP characteristics: logbook, renovation roadmap, tailored renovation advice, monitoring of decarbonisation of building stock

The Flemish Energy Agency (VEA), in cooperation with a wide network of stakeholders, designed and implemented the “Renovation Pact” (2014-2018) with the aim to improve the region’s building stock. Flanders (Belgium) established that by 2050 the existing building stock should become as energy efficient as the current requirements for new buildings (E60⁸). One of the main actions foreseen in the Renovation Pact is to develop the Woningpas, a logbook, as well as the EPC+, which is a more user-friendly version of the EPC, including a clear overview of measures, ordered by priority, needed to reach the 2050 objective [13].

The Woningpas is a unique integral digital file of each individual building. The file can be retrieved by the building owner and by individuals who have been granted access. The logbook features energy performance, renovation advice, the housing quality (such as stability, humidity, safety) and data on the environment. In the future other building aspects such as durability, water, installations and building permits will be included. The Woningpas makes it possible to track the evolution of each individual building. The first version of the instrument was launched in 2018 [13].

The EPC+ was launched in January 2019 and outlines the actions the building owner should take in order of priority to bring the current energy performance of the property to the level of the long-term objective. The tool includes recommendations for various elements that accompany a thorough renovation (airtightness, ventilation etc.) and technical information to avoid lock-in effects. No recommendation is provided if the building is compliant with the long-term objective [13].

The enriched version of Woningpas (updates will be integrated throughout 2019 and 2020) will link the EPC+ recommendations with the financial incentives available (e.g. prime lending rates, subsidies, tax credits, eco-loans).

⁸ According to Flanders’ energy efficiency legislation (EPB), requirements for insulation and ventilation are set and the overall energy efficiency of a new home is classified according to the so-called E-standard. A low E number indicates a highly energy-efficient home. The standard for new buildings in 2016 was E60, corresponding to a primary energy demand for new and non-residential buildings of 100 kWh/m²/y.

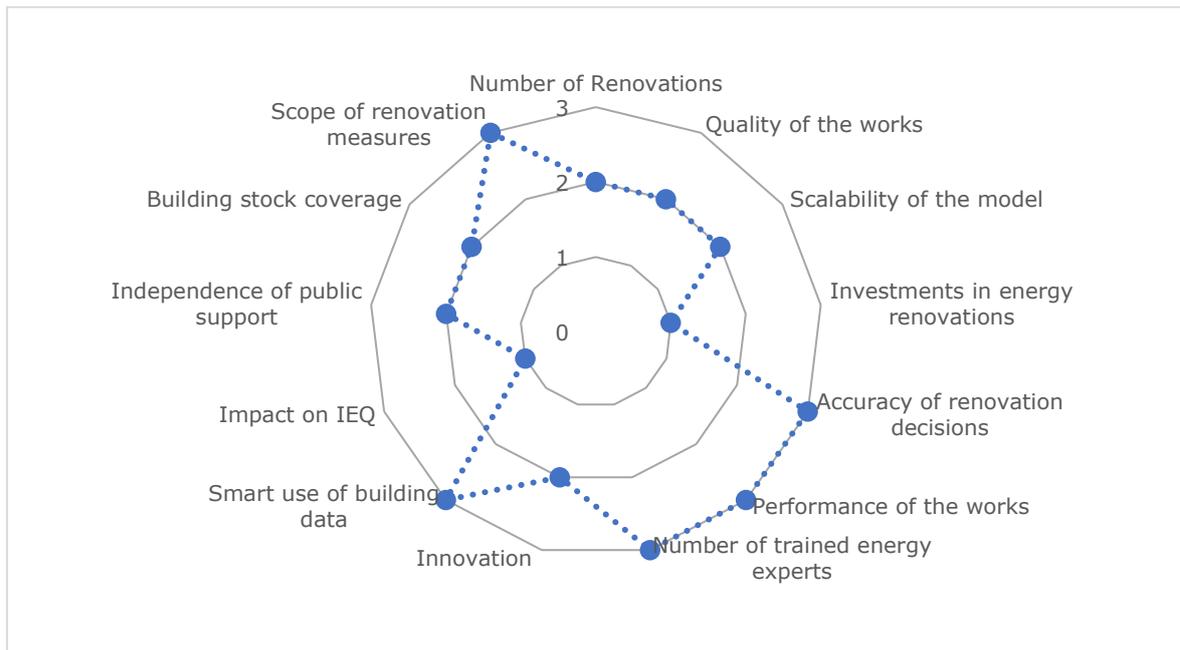


Figure 6: EPC+ & Woningpas - rating per indicator



Key results

Woningpas [14]

- A survey of the users shows that 35% of respondents think the information in the Woningpas stimulated them to renovate
- 49% of respondents think the Woningpas brings “added value to their home”
- 47% said the Woningpas gives a good overview of the renovation steps needed in the future
- 48% said the Woningpas makes clear why “saving energy is important”
- 40% think that the Woningpas gives a good overview of the building elements that determine the energy performance of the building
- 85% consider “information on energy” to be the most interesting feature of the Woningpas
- The most important reason for people to carry out energy renovations are; to reduce energy bill (35.9%), increase comfort (27.5%) and because they are “environmentally conscious” (20.8%)

EPC+ [14]

- Since its launch in January 2019, 12,814 EPC+’s for single-family houses and 7,339 EPC+’s for individual apartments have been issued (status in April 2019)
- Buildings with EPC rating B are on average worth 10.9% more than buildings with rating E
- Buildings with rating B are on average sold 25% faster than buildings with rating E [6]

[6] HeizCheck



BRP characteristics: automatic renovation advice, data registry

HeizCheck (heating check) is a German online advice instrument developed by [co2online](#), a not-for-profit consultancy. The instrument provides building owners with a first analysis of the building, initial recommendations and information on how to proceed. HeizCheck aims at increasing transparency on the housing market and trigger energy-saving investments. The technical instrument is designed to be very user-friendly and the information is accessible for all. Around 1,600 HeizChecks are issued every week.

For the evaluation of heating consumption and related costs, information that can be derived from a heating bill is required, including heating source, consumption and heated floor area. The result categorises the building according to the energy consumption (low, medium, high, very high), which provides the user with a first understanding of the situation and compares the energy use with other buildings in the district and country. The building owners receive an automated energy report, comprising the result of the check [15].

In addition to the HeizCheck, [co2online](#) has developed nine complementary checks, including an electricity check ([StromCheck](#)) and a subsidy check ([FördermittelCheck](#)). Based on building data and electricity consumption, the [StromCheck](#) compares the consumption to similar households and indicates how much electricity is used, which saving measures to implement, as well as an indication of costs and how much CO₂ they could save. The [FördermittelCheck](#) is a popular instrument as it informs the user of the available public subsidies for each measure and performance level [15].

Over 1 million users have used the different checks, providing the organisation with an impressive data set. The data includes details of the buildings, location and energy consumption, as well as details on construction material. The data will be made available to the public for research purposes from May 2019 [15].

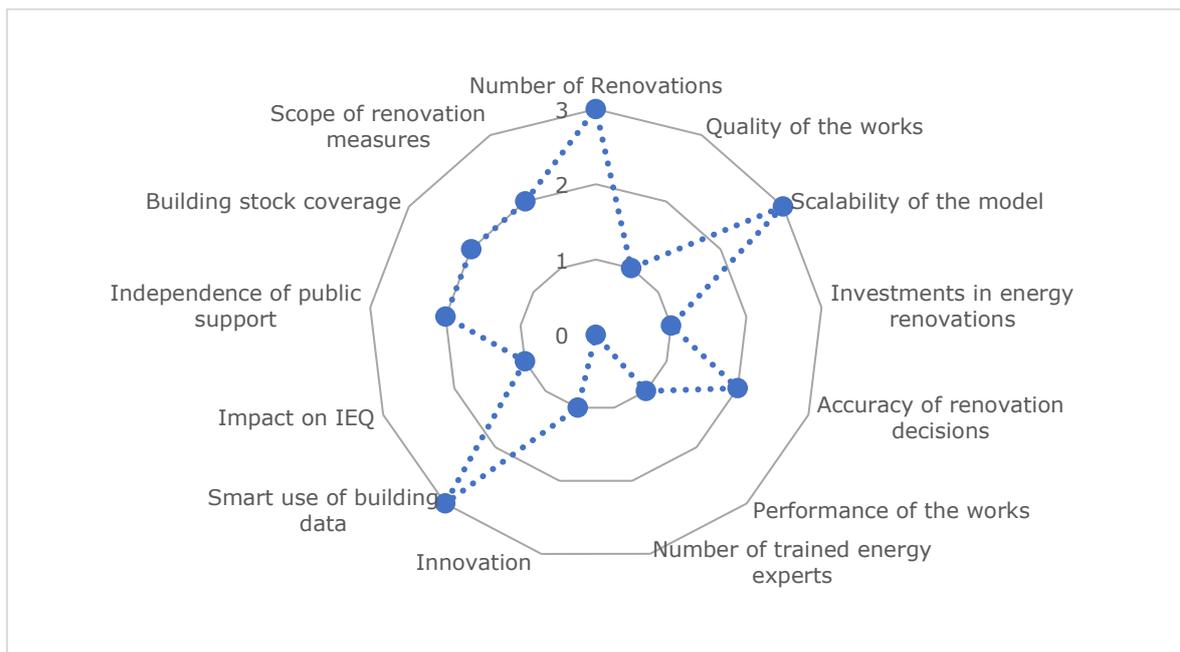


Figure 7: HeizCheck - rating per indicator



Key results

- 1,321,000 HeizChecks were conducted up to April 2019. The current weekly average is 1,550, which amounts to around 83,500 per year [16]
- Co2online has evaluated the impact of the 1,321,000 HeizChecks to have:
 - avoided 2,409,000 tonnes of CO₂ emissions
 - triggered €911 million in sales (Umsatz-potenzial)
 - created 11,636 persons-year of labour (Beschäftigungs-potenzial) [17]
- 11% of HeizCheck users state that the instrument was decisive in their renovation decision [16]
- 64% of the HeizCheck recipients had either finished their renovation (8%), started their renovation but not finished all the foreseen measures (31%), or were planning to implement measures in the near future (25%) [16]
- The most common reason not to renovate is a satisfactory, or good, HeizCheck result (81% said this was the reason) [16]
- Users with larger buildings are less likely to invest in renovations: among buildings that are smaller than 400 m², 46% renovated or were planning to do so, compared to 28% in buildings larger than 400 m² [16]
- Lack of information is the most important reason why people don't apply for funding: 38% did not apply because they could not find the appropriate support for their measure, while 28% thought the procedure was too complicated. A quarter (26%) did not have enough information about the available subsidies and 23% considered the funding conditions to be unfavourable [16]
- 56% said that they would renovate less if there were no subsidies available, though only 9% said that they wouldn't implement any measures if this was the case [16]
- Most users plan to implement 2 or 3 renovation measures (each 23% of respondents) while 17% are planning to implement a single measure [16]
- Most common (implemented and planned) measures are related to the building heating system (58%), windows (48%), roof insulation (46%), insulation of the basement ceiling (36%) and façade insulation (35%) [16]



[7] Home Energy Masterplan



BRP characteristics: renovation roadmap, tailored renovation advice, on-site visit

The Home Energy Masterplan is an integrated one-stop-shop solution in the United Kingdom, which comprises a detailed survey tailored to help homeowners identify the best possible approaches to improve their home. The model was launched in 2009 by [Parity Projects](#), a company providing a range of energy solutions to the residential building sector.

A Home Energy Masterplan is developed based on site visits from which a detailed survey is answered. The plan is tailored to the building status and the needs of the occupants. The data from the site visit is inputted into a program, which generates a report outlining the current building status together with a number of options. Each renovation option includes a cost-benefit analysis, energy use and costs, environmental impact and comfort. Personalised energy saving recommendations are provided along with details on the order in which the measures should be carried out [18]. The model does not, however, incorporate a long-term decarbonisation plan for the building.

The UK has a long tradition of energy reports indicating a building's energy performance level and energy use, with over [25 million EPCs issued](#). The Home Energy Masterplan is an instrument for building owners wanting a more in-depth analysis of their building, as well as tailored advice on how to increase the building's energy performance.

Compared to countries such as France and Germany, there are few financial support schemes targeting renovation of buildings in the UK. Over the last few years, building owners have seen the removal of many of the retrofit incentives, including the disappearance of insulation subsidies, massive reductions in feed-in tariffs and the demise of the Green Deal [19]. The main schemes remaining are:

- the [Domestic Renewable Heat Incentive](#) which is a financial incentive to promote the use of renewable heat.
- [Energy Company Obligations](#) which obligates energy suppliers to promote measures which improve the ability of low income, fuel poor and vulnerable households to heat their building.
- [minimum energy efficiency standards](#) that requires rented domestic and non-domestic building to comply with EPC rating E.
- [Boiler Plus](#) which aims to improve energy efficiency of homes in the UK by increasing the requirement of domestic heating systems.

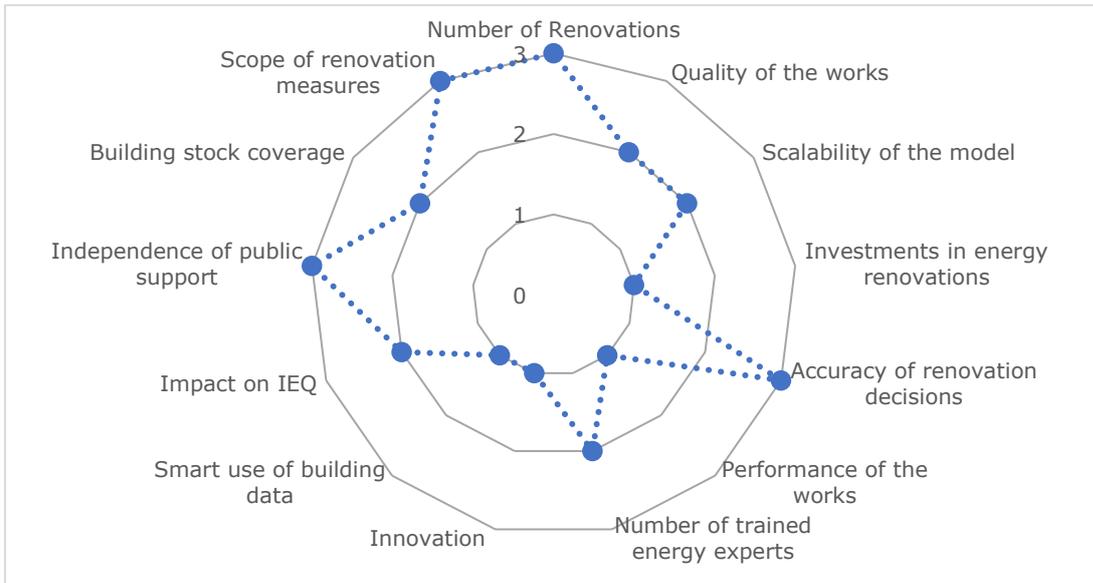


Figure 8: Home Energy Masterplan: rating per indicator

It was not possible to obtain any evidence from this scheme.



[8] Individueller Sanierungsfahrplan & [15] Sanierungsfahrplan BW

BRP characteristics: *renovation roadmap, tailored renovation advice, on-site audit, integrated with other instruments and policies* The Sanierungsfahrplan in the German region of Baden-Württemberg (SFP BW) was the first renovation roadmap for individual buildings. It is designed as an energy audit instrument and carried out by certified energy auditors. It was developed in 2013 by ifeu and ECONSULT on behalf of the Ministry of Environment, Climate Protection and the Energy Sector Baden-Württemberg. The roadmap is an evolution of the rather simple energy audit scheme ("Energiesparcheck"), and is based on an on-site audit of the building. The instrument widens the idea of an energy audit by integrating a personalised and long-term perspective as well as a life-cycle approach. The core of the product is a so-called "roadmap page" which contains all the required renovation steps and a summary of the core information [20].

In 2008, the region was the first to mandate the installation of renewable heating technologies (EWärmeG), which obliged building owners to employ renewable energy to cover at least 10% - increasing to 15% in July 2015 - of the heat demand when replacing their heating system. The regulation covers all residential buildings and most types of non-residential buildings. A part of the obligation can be fulfilled by carrying out an energy audit of the building based on an individual building roadmap (5 percentage points in residential buildings) [21]. The SFP BW is supported by a funding scheme run by the state bank of Baden-Württemberg, the L-Bank. An SFP for one- and two-family houses receives €200 in funding, with each apartment unit adding a further €50 up to a limit of €500⁹ [22].

Based on the experience in Baden-Württemberg, the "individueller Sanierungsfahrplan" (iSFP) was launched at the national level in 2017. The iSFP has been designed to be a user-friendly tool that includes both short- and long-term renovation measures and suggests ways to avoid lock-in effects. As about 85% of the energy renovation measures funded in Germany concern only one building component, the iSFP puts a strong focus on staged renovation and the interdependences between the stages [23].

The iSFP is a further development of the SFP BW. It leads to a more detailed consultancy document, including an eight-page summary and a detailed booklet with a description of all the measures and renovation packages, including, if necessary, photos, sketches, graphics and further information relevant for tradespeople or planners. In addition, it is graphically more advanced, placing an emphasis on the psychological barriers to renovation by giving background information, next steps, etc. In an update of the iSFP to be published in summer 2019, additional features will be available, including a layout update, a new page on the co-benefits of renovation and more tailored information on renewables and user behaviour [23].

In Germany, EPCs are not considered reliable enough to stimulate renovation and are often viewed as an administrative obligation. On the other hand, there is a strong culture of on-site energy auditing, but the very detailed reports delivered to building owners (up to 150 pages) are often left unread and do not promote staged renovations. Since July 1, 2017, the iSFP has been accepted as an audit report within the federal Office for Economic Affairs and Export Control (BAFA) support programme "Energieberatung vor Ort" (see page 15). This programme grants subsidies of up to 60% of the cost for an on-site audit (maximum €800 for single and two-family buildings, and up to €1,100 in buildings with three or more dwellings).

⁹ With the iSFP funding at national level and changes in the national programme with respect to the accredited energy auditors, the L-Bank programme will only continue until end of 2019.

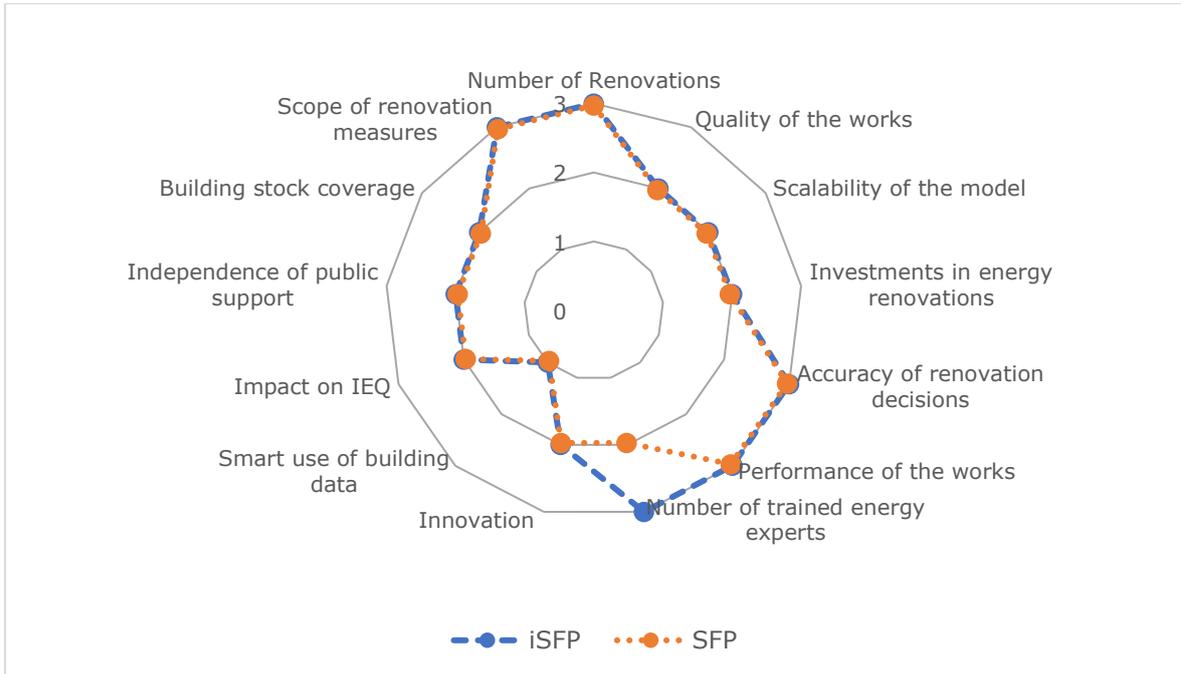


Figure 9: iSFP & SFP: rating per indicator



Key results

Sanierungsfahrplan BW

- Around two-thirds of the subsidised SFP BW were issued for one- and two-family houses [21]
- The final energy demand of the buildings receiving an SFP was around 180 kWh/m²/yr, and 85% of buildings had efficiency class E or worse [21]
- The building's CO₂ emissions are estimated to decrease by an average of 65% between the initial and final stage of the roadmap [21]
- The average consulting costs for single- and two-family buildings are around €735 and €760 respectively, while for a multi-family building with nine residential units the average costs amount to around €1,540 [21]
- By mid-2018, around 2,300 renovation roadmaps had been developed as part of the "EWärmeG" programme, amounting to CO₂ savings of around 1,300 tonnes per year [21]
- 33%-40% of building owners receiving an SFP stated that they would have commissioned a roadmap without any subsidies, while 17%-18% saw the subsidy as decisive for their decision and 25%-35% saw it as a major incentive [21]
- Most building owners say they are satisfied with the advisory effect of the SFP and its explanations: 75% rate it at least as partially useful [21]
- The SFP is particularly effective in triggering measures that would have otherwise been neglected, such as hydraulic balancing (45% stated that the SFP was causally responsible for carrying out or planning this measure), insulation of the basement (44%), or the use of renewables (39%) [21]
- The number of publicly funded detailed audits per inhabitant in Baden-Württemberg has increased by 107% since 2015 (when the SFP was introduced), while the number of detailed audits decreased by 29% in the rest of Germany (analysis based on BAFA data for 2013 - 2018)

Individueller Sanierungsfahrplan

- For the iSFP, the only available data is from an early pilot stage since it was launched in the fall of 2017 [23]
- A pilot study was carried out in 2018 testing the iSFP on 20 residential buildings, of which 17 were finalised [23]. The study shows that 9 out of 17 (53%) building owners preferred a step-by-step renovation process, while 4 building owners preferred one-time renovation and 4 owners had not decided
- 9 out of 12 building owners answered yes to the question "has the iSFP helped you develop a long-term perspective?"
- 10 out of 12 building owners answered yes to the question "has the iSFP made you interested in carrying out further renovation measures?"
- 10 out of 14 building owners answered yes to the question "has the iSFP increased your understanding of how energy renovations affect energy costs and comfort?"
- 9 out of 14 building owners answered yes to the question "has the iSFP increased your understanding of how different energy measures work together?"
- 11 out of 14 building owners answered yes to the question "has the iSFP increased your understanding of which renovation measures are economically sensible?"
- 13 out of 14 building owners answered yes to the question "has the iSFP increased your understanding of which renovation measures are technically necessary or meaningful?"
- 11 out of 14 building owners answered yes to the question "has the iSFP increased your understanding of the current state of the building?"



[9] Ma Rénov



BRP characteristics: tailored renovation advice, integrated with other instruments/subsidies, post-renovation checks

French [Bordeaux Metropole](#)'s integrated renovation platform "Ma Rénov" was launched in 2017 to achieve the objectives of the Bordeaux Metropole Climate Plan, to renovate 2,000 private and 1,000 social housing units per year. The city's focus is on deep renovation to increase the number of low-energy buildings¹⁰ [24]. The solutions aim to create a critical mass of renovation projects providing financial and technical support to homeowners while coordinating all key stakeholders.

Energy advisors guide the homeowners throughout the whole renovation process, from an initial contact to the end of the renovation works. The homeowner visits the platform and creates a personal account, which is followed up by an online self-energy audit. Based on the available data, an energy advisor develops an energy renovation plan including expected energy savings and estimated renovation costs. The homeowner is then matched with the most appropriate tradespeople and the best financial solution is identified [24]. The support for the homeowner includes:

- An automatic diagnostic of their energy consumption through an online tool
- A renovation plan tailored to the building
- A financial plan guiding the owner to accessible subsidies and low-interest loans (Bordeaux Metropole collaborates with banks to offer energy renovation loans)
- Help with finding the right tradespeople
- Post-renovation monitoring [24]

The renovation advice is tailored to the specific building and is based on a step-by-step guidance. The reasons are that few people can afford a BBC-renovation in one step but also a lack of skilled tradespeople and companies that can carry out this kind of work [25].

The data needed for the renovation plan includes area and age of the property, estimated energy performance certificate before the works, previous renovations and invoices. The city is considering integrating a database of the actual energy savings, which would allow Bordeaux Metropole to track the decarbonisation of its building stock [26], similar to what Flanders is doing with the Woningpas (see page 17).

If the model is successful in increasing the number of deep renovations, Bordeaux will need more highly skilled building professionals in the area. While no training sessions have been provided within the project to this point, a new [ELENA](#)¹¹-funded project includes training of "building firms and engineering consultants" to facilitate this objective [25].

¹⁰ i.e. Bâtiment Basse Consommation (BBC) which requires a performance of 50 kWh/m² per year

¹¹ ELENA is a joint initiative by the EIB and the European Commission under the Horizon 2020 programme. ELENA provides grants for technical assistance focused on the implementation of energy efficiency, distributed renewable energy and urban transport programmes.

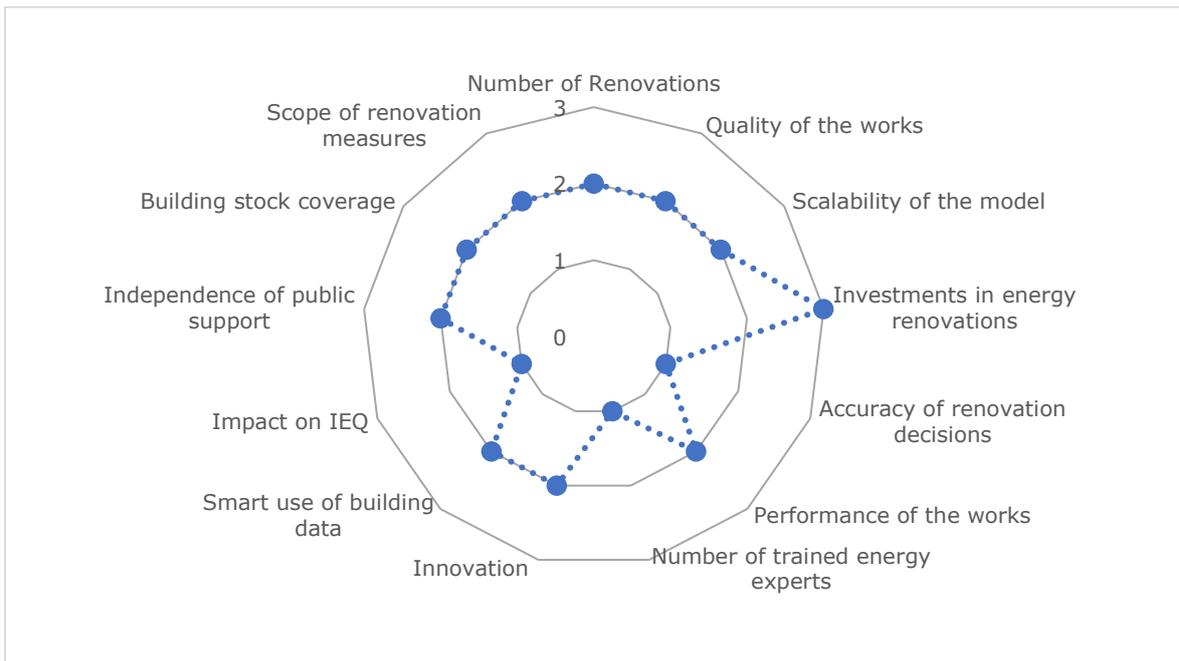


Figure 10: Ma Rénov – rating per indicator



Key results

- Ma Rénov is still at an early stage and no real evaluation exists
- In 2018, 18 186 people visited the platform and 2 512 families received support from the energy advisors [25]
- 97% of the families that meet the energy advisors are satisfied by the service provided [25]



[10] Oktave



BRP characteristics: tailored renovation advice, on-site audit, post-works care, integrates financial possibilities

Oktave is a one-stop-shop model in the French region of Alsace, which aims to increase the number of deep renovations. The model provides the building owner with a main point of contact that guides them throughout the renovation process. The support includes:

- Technical renovation advice tailored to the specific building
- Support with a financial plan, combining potential grants, tax rebates and low-interest loans
- Project management assistance throughout the renovation process
- Personalised “post-works care” for two years after completion of the renovation
- A directory of qualified and experienced professionals trained by Oktave to guarantee long-term performance [27]

The renovation process follows four main steps:

1. The first step comprises the initial contact and on-site visit, from which the suggested measures are derived. The renovation plan is discussed and outlined based on the need and financial means of the homeowner. Following this, an Oktave contract is signed, stipulating the terms and cost.
2. The Oktave advisor gathers offers from relevant building professionals and puts together the most appropriate renovation package. The homeowner agrees on a renovation and financial package suggested by the advisor.
3. The renovation works take place, during which the advisor supports the homeowner when needed. A blower-door test is used to control the general quality and performance of each renovation.
4. The final step is the “post-work care”, in which the advisor stays in contact with the homeowner and ensures the technical and financial plans work as they intended to.

Oktave has set up a teaching programme to improve the contractors’ technical and sales expertise in deep renovations. After the teaching programme is completed, contractors are entitled to perform deep renovations. Oktave experts are also available for hire on demand to solve complicated situations. The overall goal is to increase the capability of professionals (management, sales technicians and construction workers) to manage a deep renovation process in a simplified and coordinated way and by doing so reduce the risk of mistakes. By 2017, around 250 building professionals had been trained within the programme [27].

Oktave has also developed a partnership with the real-estate agency ORPI France. A simulation tool and training programme were developed for real-estate agencies and are currently being tested (April-December 2019), which will enable Oktave to effectively target clients with a suitable budget and needs [28].

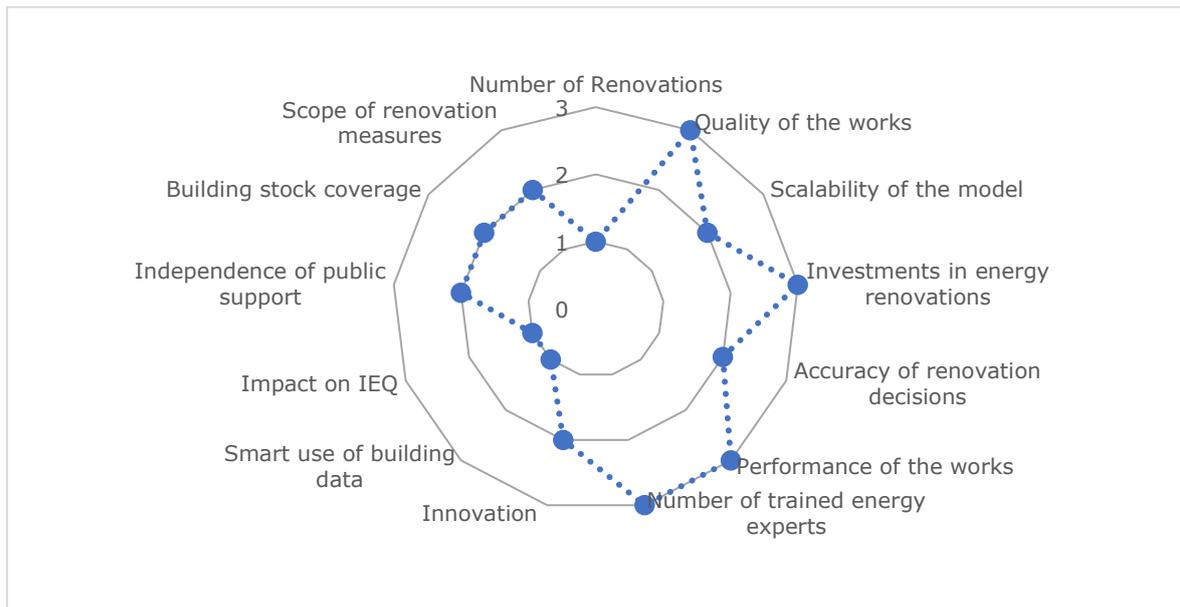


Figure 11: Oktave - rating per indicator



Key results

- Average energy saving per project: 10.6 MWh/year (heating only) [28]
- Number of projects: 180 projects (from 2016 to 2018). The number of supported renovation projects is projected to increase to 1,000 per year in 2021/2022 [28]
- Total investment: €10.3 million [28]
- Share of private investments: 86% (23% personal contribution, 63% loans)
- Share of public grants: 14% [28]
- Conversion rates:
 - First contact → dialogue: 25%
 - Dialogue → investment: 50%
 - First contact → contract: 12.5% [28]
- Performance level: all projects reach a low-energy level (BBC)[28]
- The energy advisors spend on average 35 hours per project [28]
- Annual communications cost: €200,000 [28]
- The total advisory service cost amounts to around €2,754 plus VAT (up to €1,500 of this will be funded by regional operators through "Energy Saving Certificates") [28]



[11] Passeport Efficacité Énergétique & [12] Passeport Energie Habitat



BRP characteristics: automatic and tailored renovation advice, renovation roadmap

The Passeport Energie Habitat (PEH) and Passeport Efficacité Énergétique (P2E) are two new French BRP models. P2E is a BRP concept that was first developed by the [Shift Project](#) together with a group of building specialists and professionals, with the objective to unlock the thermal renovation of residential buildings. The P2E was made operational by [Experience P2E](#), an association of think tanks, regional and local authorities, and industrial stakeholders. The PEH instrument was developed by l'Agence Locale de l'Energie et du Climat ([ALEC49](#)), an association of stakeholders initiated by Angers Loire Métropole to support the region's climate and energy work. It aims to incentivise building owners to renovate and by extension contribute to the decarbonisation of the building stock [29].

The P2E includes basic information on the house, household and the energy expert. It outlines two-stage renovation process, including indication of performance for each of the measures, the overall cost, information on why renovation should be coherently staged and how to ensure this, as well as general information on why renovation will benefit the homeowner. The P2E web application is used by the expert to develop a very simple diagnosis of the building and outlines a set of "performance combinations" that would allow that specific building to become a low-energy building (BBC¹² and SNBC¹³ levels). These combinations provide a set of consistent solutions for all parts of the building, enabling an effective renovation procedure [13].

Inspired by the P2E, ALEC49 developed the PEH as a local version of the instrument. As with P2E, PEH is developed based on available data and user-input. The roadmap shows the energy performance level and quality of different components and provides tailored recommendations. After the roadmap is developed, an energy expert meets the homeowner and explains the details of the PEH, an opportunity also used to further explain the benefits of more comprehensive measures. Ultimately, the homeowner decides how ambitious the roadmap will be. While the P2E roadmap is in two pages, the PEH roadmap runs to eight pages and provides detailed energy simulations as well as financial simulations [29].

By simplifying the choice among possible solutions for the renovation and making it easier both for the building owner and the energy expert, the system aims at "industrialising" the renovation process while maintaining a high degree of "individualisation". Indeed, the passport requires an on-site visit by an energy auditor but is quicker and far less expensive than a traditional audit in order to enable rapid upscaling. This approach frees energy experts from time-consuming on-site measurements and detailed energy simulations and lets them focus on adapting technical solutions to the house and raising households' confidence through exchange. The performance requirements should also help standardise renovation materials, achieving economies of scale.

¹² French Low Energy Building Standard, max 80 kWh PE/m²/y – Bâtiment Basse Consommation

¹³ French Low Carbon National Strategy – Stratégie Nationale Bas Carbone

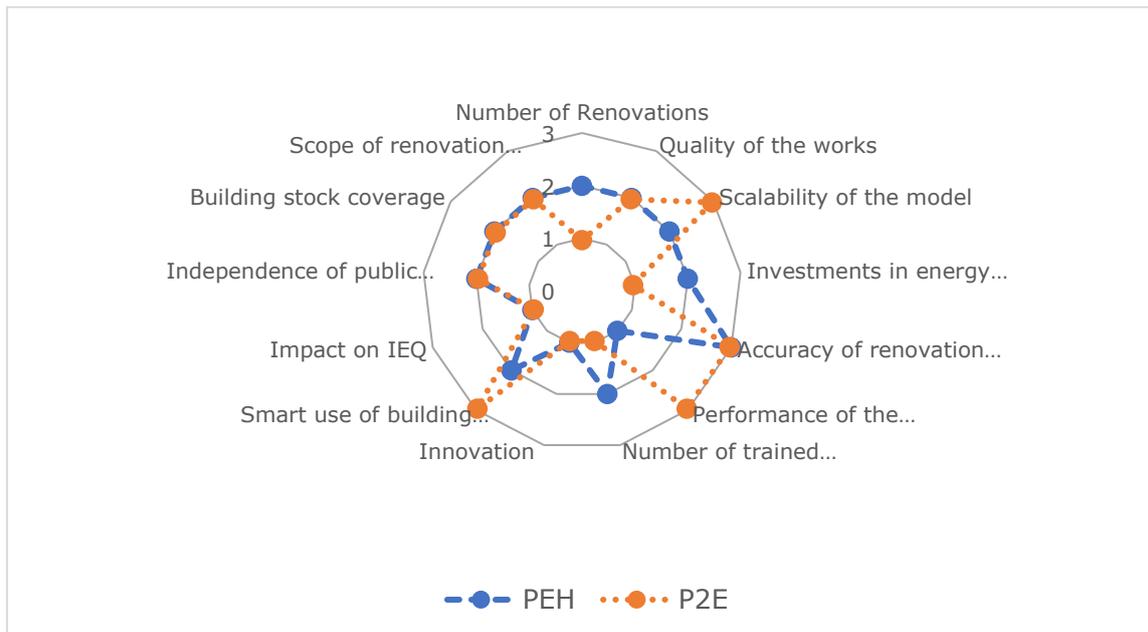


Figure 12: P2E & PEH: rating per indicator



Key results

P2E

- 1,172 P2Es were carried out in several test phases between 2016 and 2018 [29]
- The survey of piloted households shows that they are very satisfied by the passport in terms of duration, reliability and value of the provided information [29]
- Two-thirds (68%) of the piloted P2Es stated that the instrument triggered additional energy saving measures:
 - 19% extended the planned renovation to cover additional measures
 - 19% increased the energy performance level of an already-planned measure
 - 30% integrated energy performance measures in their previously non-energy-related renovation project
 - 32% said the P2E had no effect on their project [29]
- 72% of the households found the information provided by the energy expert to be "reliable" or "very reliable" [29]
- All piloted households said the P2E recommendations were more useful than recommendations received through other assessments of their building [29]
- 39% of energy experts felt comfortable with the tool after first use, 44% stated the same after the second use, while 39% felt they needed more time to become familiar with the instrument [29]
- The overall time of a P2E for the energy expert is half a day (4 hours on average, including first contact and transport and the on-site visit, which itself takes around 2-2.5 hours to conduct [29]
- Energy experts estimate the P2E would cost around €400 including VAT, yet households are on average willing to pay around €105 [29]

PEH

- 682 PEHs were carried out between 2015 and 2018 [30]
 - From these 136 renovations were conducted, a conversion rate of 20% [30]
 - The PEH renovations had an average energy saving of 30% [30]
- The energy expert spends around one hour to explain the PEH to the homeowner [30]



[13] Picardie Pass Rénovation



BRP characteristics: tailored renovation advice, on-site audit, integrates financial possibilities

Picardie Pass Rénovation is a one-stop-shop for homeowners in the Picardie region of France, launched in 2014. The model provides the homeowner with a single point of contact, an on-site energy audit, recommendations of how to optimise energy savings, integrated financial solutions and post-installation checks. The model also assists the homeowner in finding the right expert and construction workers to carry out the work [31].

The homeowner is offered a free on-site audit, from which personalised recommendations are derived. During this audit, the technician gives information, offers personal advice and makes a technical diagnosis (envelope, heating systems, ventilation etc.) as well as a financial evaluation. This diagnosis defines an optimal and appropriate work programme, considering the needs and desires expressed by the household. In a second phase, after a contract between the owner and Picardie Pass Rénovation has been signed, the homeowner receives support for the selection partner companies, the planning of the renovation works, as well as financial guidance until the homeowner finds a suitable solution that he/she accepts [32].

The installed measures consist typically of improvements to the building envelope, as well as renewing the heating system, ventilation and on-site renewables. The energy consumption of the building is monitored over a five-year period to make sure the goals are achieved. During this five-year period, the homeowner also receives “eco-coaching” and support for equipment use and maintenance in order to limit the “rebound effect”¹⁴.

The region was a pioneer in setting up a third-party financing mechanism (Picardie PSEE) to facilitate investments in deep energy renovations and by doing so boost the local economy. The innovative financial model is made possible through Picardie Region allowances, grants from ADEME, ELENA and FEDER, as well as a loan from the European Investment Bank. The PSEE also includes a public fund, which enables long-term renovation investments that wouldn't be financially viable otherwise. The intention is that loan repayments plus energy costs after the renovation are not greater than the energy costs before the renovation. On average, 70% of the monthly loan repayments are covered by energy savings. The average financial package consists of 13% subsidies, 17% self-finance and 70% covered by the third-party mechanism [32].

¹⁴ The rebound effect is the difference between the theoretically expected savings and the savings achieved in reality.

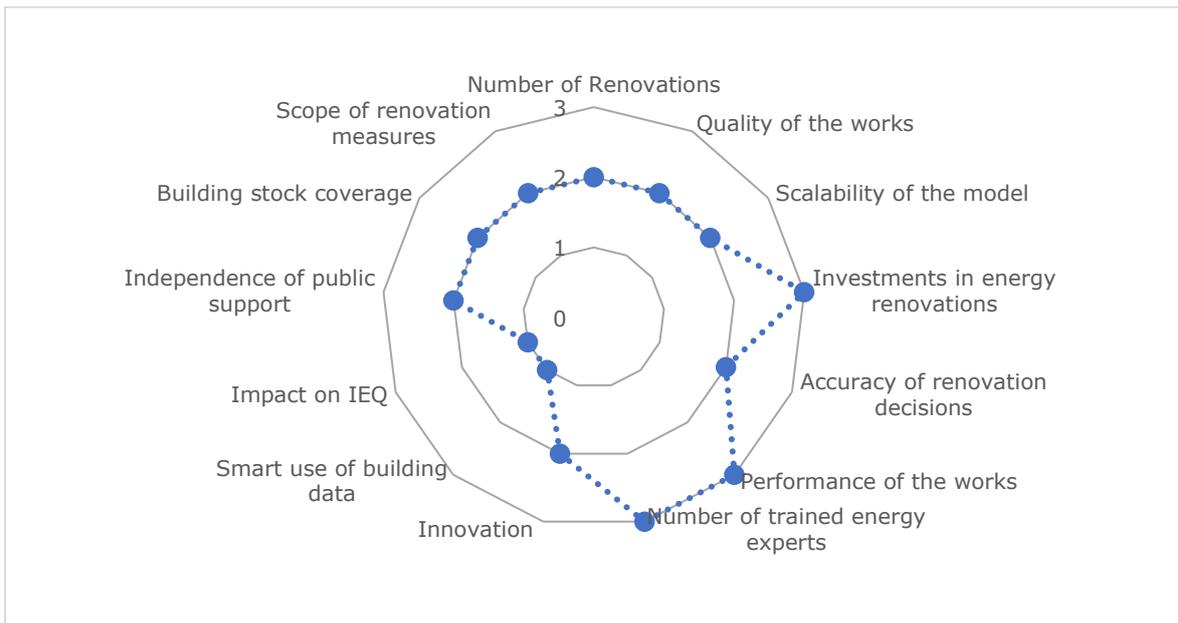


Figure 13: Picardie Pass Rénovation - rating per indicator



Key results

- 868 single-family houses and 863 dwellings in multi-family houses have been, or are planned to be, renovated [33]
- 20% of the Picardie projects reached a low-energy building (BBC) level [33]
- Average energy savings are 54% (before: 272 kWh/m²/y, after: 124 kWh/m²/y). Average EPC rating went from E to C [33]
- Conversion rates:
 - First contact → diagnostic: 45%
 - Diagnostic → contract: 20%
 - First contact → contract: 9.1% [33]
- By the end of 2018, 7,288 single-family houses had had a first contact, while 2,758 energy audits had been conducted and 868 renovations were planned or already finished. 24 condominiums (2,606 dwellings) had had a first contact, 14 (1,207 dwellings) energy audits had been conducted, and 7 (863 dwellings) renovations were planned or already finished [33]
- The average investment cost for single-family houses was €42,780 and €15,400 per dwelling in a multi-family house [33]
- While the homeowners have the option to only utilise the technical support, 70% choose to use both the technical and financial services [33]



[14] Rénoclimat



BRP characteristics: tailored renovation advice, post-renovation check, integrates financial possibilities

Rénoclimat is a one-stop-shop model in the Canadian region of Québec, launched in 2007¹⁵ to encourage homeowners to invest in energy-saving measures. Like many European one-stop-shops, the model combines technical renovation advice with financial guidance and support [34].

An energy assessment of the building is central to the programme, which covers more than 50% of the costs associated with energy assessments. During the renovation process, an energy advisor carries out two on-site energy assessments, before and after the renovation works:

1. On the first visit, the energy advisor establishes an "EnerGuide rating¹⁶" of the building. The homeowner also receives a personalised energy report including renovation guidance and recommendations. The homeowner is then expected to conduct the renovation according to what is outlined in the report.
2. When the renovation is completed, the energy advisor evaluates the work and establishes a new energy rating for the home. The second visit also confirms if the installed measures are eligible for financial support.

Financial assistance is provided for insulation work (including airtightness, replacing doors and windows) and for installing or replacing mechanical systems (including ventilation system, water heater, heat pump, geothermal heating system). The attainable grant varies between measures and how comprehensive they are: for example, financial support for insulation of external wall ranges from \$295 to \$2,440 (\approx €196 to €1622) depending on how much of the wall is being reinforced [35].

¹⁵ The governmental Transition énergétique Québec has been responsible for this programme since 2017, which also corresponded with changes in how the programme worked

¹⁶ The EnerGuide rating provides homeowners with a government-approved label indicating the building energy efficiency level. The rating was developed by [Natural Resources Canada](#).

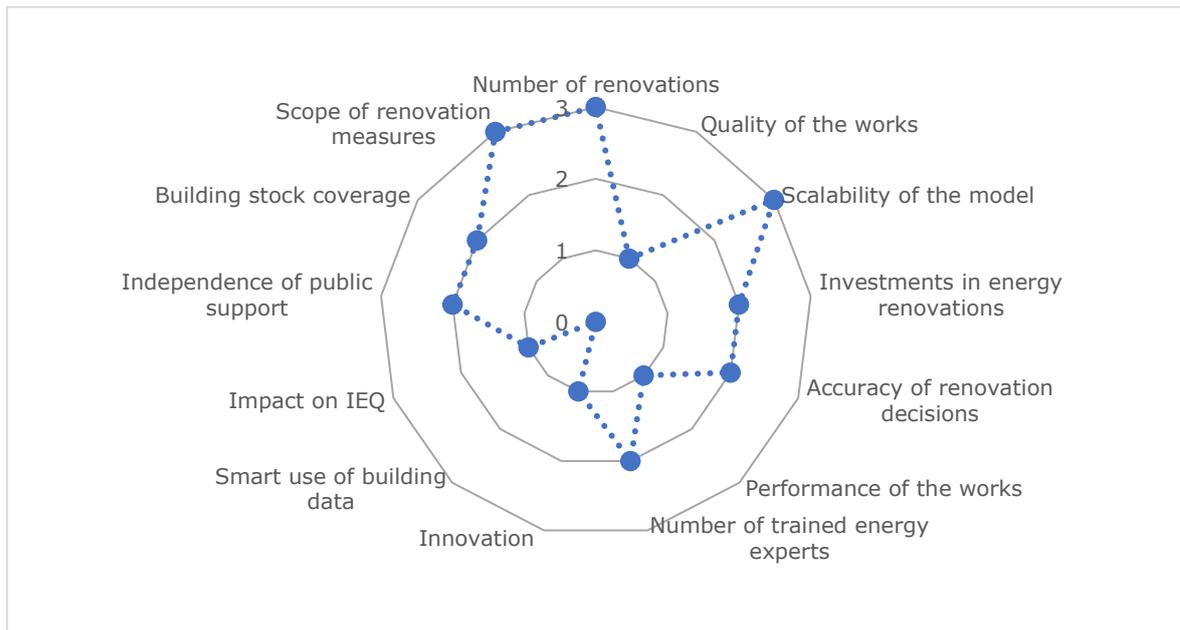


Figure 14: Rénoclimat – rating per indicator



Key results

- On average, the Rénoclimat programme helped participants to save 20% on their heating bills after their renovations were completed [36]
- 78% of the homeowners receiving the first on-site visit implemented at least one of the recommended measures, while 14% implemented all of them [36]
- The implementation rate of insulation and heating measures among homeowners only getting the first on-site assessment, is on average 10% higher than among the control group [36]
- The implementation rate among homeowners getting two on-site assessments (before and after works), is on average 26% higher than among the control group [36]
- A survey shows that 78% of the investments would have been made even in the absence of on-site visits and grants, while 86% would have been made if the visit was available but no grant [36]
- 78% of respondents planned to make energy efficiency work before hearing about the programme [36]
- 50-60% of the people who carried out renovation work said that the programme had no influence on their decision. From this, it is estimated that the programme had a decisive impact on the renovation decision in 20–50% of cases [36]

[16] Superhomes



BRP characteristics: tailored renovation advice, integrated financial support

Superhomes is an Irish one-stop-shop project that has been successful in increasing the number of deep energy renovations by providing technological and financial support for homeowners. The project is run by the Tipperary Energy Agency and is mainly funded by the Sustainable Energy Authority of Ireland¹⁷. Superhomes offers subsidies to building owners of up to 50% of the renovation cost¹⁸ for renovation that brings pre-2011 buildings to an A3 Building Energy Rating (which corresponds with requirements for a new building), or as close as financially and technically feasible. The whole renovation package is carried out in one step [37].

Superhomes assists homeowners with all aspects of the energy renovation process. The customer journey comprises financial guidance, selecting the best energy saving measures and finding the right contractors. The potential customers are reached through visibility online or at actual information events. The primary target group is homeowners who are interested in doing more than a single renovation measure. The renovation is typically conducted in one stage.

Within the project, an on-site home survey is conducted, going beyond the common EPC assessment. The complexity of a deep renovation is simplified and presented in a digestible way to the homeowner, while the recommendations are tailored to the specific building and the incentives of the homeowner.

The homeowner is obliged to upgrade certain parts of the building, in order to receive financial support. The primary heating system must be renewable, such as a heat pump, while an advanced ventilation system must be installed. In addition, the building's airtightness must also be upgraded. Support is also available for non-mandatory measures, such as window and door upgrades, insulation and solar PV [37].

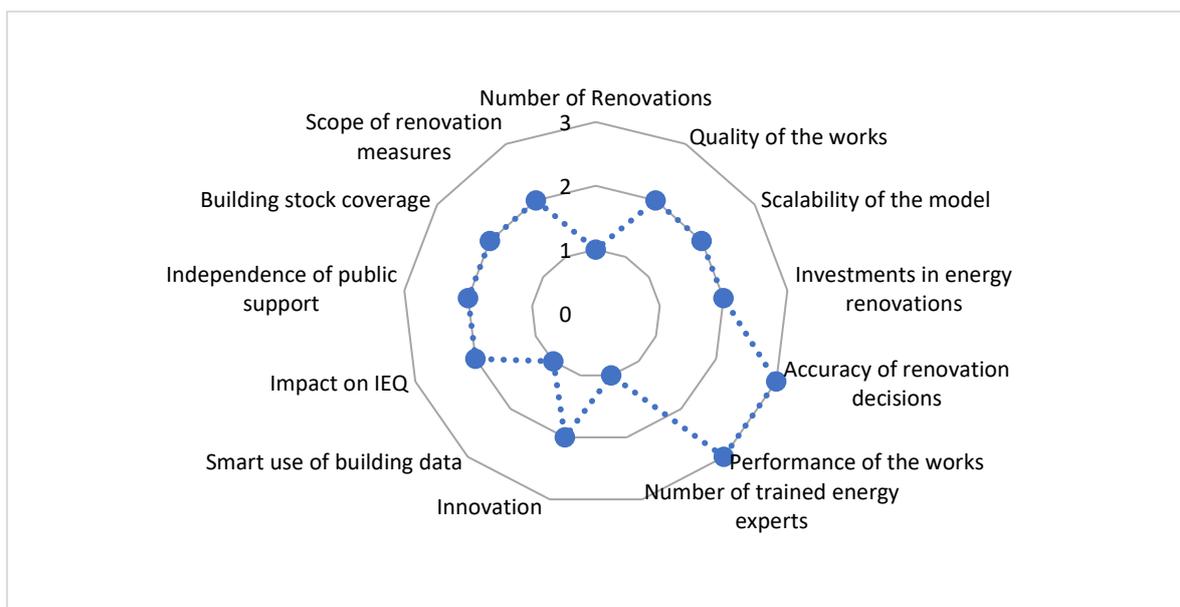


Figure 15: Superhomes – rating per indicator

¹⁷ The project has received financial support from the EU ELENA and Horizon2020 programmes

¹⁸ The grant can go up to a maximum cost of €26,000



Key results

- Around 80 deep renovations in 2019 [38]
- Average primary energy saving is 71% [38]
- Conversion rate: 33% accepted the proposed renovation package [38]
- Average cost €33,000 [38]
- A survey conducted of potential user show that the main drivers of renovation are, reducing energy costs (65%), improving comfort (60%), and reducing fossil fuel use and improving the environmental performance of the building (55%) [38]
- The same survey shows that people want their investments pay back within a reasonable time frame. 80% are happy with a payback period of 5-7.5 years, while 60% are happy with up to 10 years. Smaller market for retrofit over 10 years payback [38]
- Among homeowners who have not renovated, 69% state the barrier is that “cost is too high” followed by 38% who say they lack “understanding of what and how to improve my home” [38]
- Average energy cost reduction: €1,800 per year [38]



Conclusion

The review comprises 28 European and 5 non-European schemes and provides some valuable insights, of which 16 featured as “deep dives” (see page 9). **The most successful BRPs have combined the renovation advice with financial support, legal requirements and/or communication campaigns.** The review shows that the BRP should be integrated with and reinforced by other elements (e.g. simple access/use, financial support, communication) in order to be effective.

The most common elements among the deep dives are “tailored renovation advice” (14 out of 16) and “integrated financial possibilities” (7 out of 16). The common understanding, underlying these cases, is that **finding the right information is time-consuming and it is difficult to make informed choices about the combination of renovation measures**, especially that make sense over the long-term. The second main understanding is that **aggregating and streamlining financial support (grants and loans) is required to make long-term solutions (i.e. deep renovations) viable.**

Financial constraints are the main reason for people not to renovate and the explanation to why the innovative one-stop-shops, analysed in this report, have not conducted more than 100-1,800 deep renovations each. **Financial constraints are also the main reason why building owners choose less efficient solutions, hampering the long-term transition.** Cheap and reliable long-term finance might not be enough, the review shows that targeted renovation advice is also needed to better align the direction of private investments with the long-term vision for the building stock.

The review shows that **BRPs are effective in alleviating two of the main barriers; low awareness of the benefits of energy renovation and insufficient knowledge of what measures to implement and in which order.** The analysis confirms that the tailored renovation advice, together with other support measures, has an impact on the decision to renovate, the number of measures to implement, the performance level of the selected measures, as well as on what kind of measures that are being implemented. The major influences on the renovation decision are listed below.

- The whisker chart in Figure 16, displays the percentage of building owners who were stimulated to renovate by the received energy advice. The impact ranges from 11% (in the online renovation advice instrument) to 50% (in a one-stop-shop that provides on-site audits), with an average of 28%.

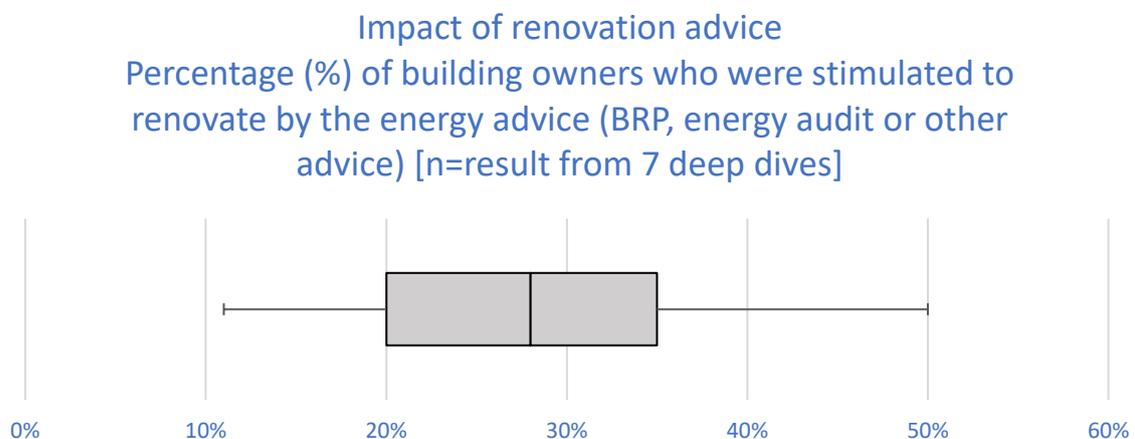


Figure 16: Impact of renovation advice



- Data from [co2online's](#) (the managers of HeizCheck) comprehensive database¹⁹ shows that most building owners (63%) are planning to implement between 1 and 3 measures, which seldom is enough to bring a building to a low-energy level. The review shows that BRPs are having a significant effect on the number of measures the building owners are planning to implement. In the iSFP pilot study (see page 23), 83% said the BRP got them interested in implementing additional measures, while in the P2E pilot study (see page 30), 19% extended their already planned renovation to cover additional measures.
- The evidence also indicates that the renovation advice influences the performance of the selected renovation measures. For example, the evaluation of the German energy check/advice (see page 15) revealed that 67% of recipients of energy advice chose A+++ product compared to 47% in the control group. In France, 19% of P2E's pilot cases state the BRP influenced them to install higher performing components.
- The renovation advice also has an impact on the type of measures that are being implanted. For example, the evaluation of the SFP BW (see page 23) shows that the majority (70%) of window replacements would have occurred even without the BRP but a considerable share of building owners that invested in hydraulic balancing (45%) or insulation of the basement (44%) did so because of the advice in the BRP.
- Furthermore, evidence from the German energy audit framework (see page 15) and the iSFP indicates the advice increased building owners' understanding of which measures are meaningful in the long-term (84% resp. 75% of respondents).
- Finally, evidence from the German audits and building checks shows the renovation advice helped building owners "avoid bad investments" (between 44% and 52% of respondents).

The conversion rate describes the process of a potential owners actually investing in an energy renovation. An optional BRP scheme will first need to convince building owners to get a BRP and subsequently the BRP will have to inspire recipients to invest in energy renovations. Figure 17 illustrates the conversion rate from four different one-stop-shops. On average, 35% of building owners informed about the scheme chose to continue with an energy check, and 31% of the people receiving the energy check and resulting advice continues to invest in energy renovation. **Consequently, 10.8% of the building owners receiving the first contact will go on an finally invest in an energy renovation.** The conversion rate depends on aspects, such as available subsidies, how complicated the renovation process is perceived, and quality of communication (user-friendly webiste, likeability of energy expert etc.).



Figure 17: Conversion rate

¹⁹ It includes user-inserted data from over 1 million online building checks



The analysed schemes and initiatives do not provide a satisfying answer on how to influence the hard-to-reach groups, who are not interested in receiving renovation advice nor investing in energy saving measures. While most people take the advice into consideration, a considerable portion are more difficult to influence. For example, 35% of building owners in Denmark did not read the renovation recommendations in the EPC-report (see page 13).

Indoor environmental quality (IEQ) is generally overlooked in the cases. Comfort is often used a key selling point, yet improved air quality, noise reduction and sufficient lighting are rarely mentioned. While building regulations and energy experts incorporate these aspects to a certain extent, **the BRP could help to optimise IEQ alongside the building performance**. Circularity is another crucial concept that is not sufficiently covered in the existing cases. Again, the BRP could potentially be used to facilitate an effective recycling of certain components.

The review indicates that training of energy auditors, financiers, public officials and other professionals is needed to facilitate the shift to deep (staged) renovations. Training is needed on several levels, from how to develop the BRP to how to approach building owners. In addition, training is needed to increase the technical skills to facilitate effective installations of deep renovation measures, which often are more complex. The experience of Bordeaux metropole, where the construction value chain is not ready to carry out one-stage deep renovations (see page 27), is shared by many regions in Europe. A higher technical knowledge is also needed to ensure the deep staged renovations are successfully planned and implemented.

A core strength of the one-stop-shop model is that it assembles the fragmented services from the construction value chain, which simplifies the process for the building owner. The review reiterates that the BRP ought to be “user-friendly” and contribute to making the renovation process more comprehensible for the building owner.

The Flemish and Portuguese energy agencies are developing their schemes (Flemish EPC+ and Woningpas (see page 17), and Portuguese EPC (see page 11)) to directly support the objectives of their [long-term renovation strategies](#). The public authorities will be able to monitor the energy transition of each building but also modify policies and financial support as necessary. Integrating the BRP with a digital logbook and linking it to financial schemes and one-stop-shops are potentially effective solutions.

The schemes and initiatives presented in this report are diverse and most of them have not reached their full potential yet, while some still being at the research phase. The derived evidence is therefore of mixed quality. The next phase of this project will translate these findings, together with input from the European Commission, EPBD Concerted Action and stakeholder input, into potential policy packages. The ongoing stakeholder process will further discuss and define the concept, and scope, of the BRP.



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Annex 1: Overview of the schemes and initiatives

Title	Geographical coverage	Timing (project start/launch)	Conceptual basis	Link
ALDREN	EU	2018	A Horizon 2020 project that develops a renovation roadmap and logbook for non-residential buildings	Link
BetterHome	Denmark	2014	Industrial driven one-stop-shop, facilitates a smoother renovation process by setting up a central contact point and transforming the work of the energy expert	Link
BMWi Sanierungskonfigurator	Germany	2013	A public online renovation advice instrument provides a first building check based on user-inserted data	Link
Building Energy Asset Score	USA	2015	The U.S. Department of Energy's instrument is a national standardised tool for assessing the building performance of non-residential buildings and larger multi-family buildings	Link
Building Energy Rating Certificate	Ireland	2011	The national EPC framework, which comprises a public database and innovative features	Link
Certificação Energética dos Edifícios	Portugal	2007	The national EPC framework, which comprises a public database and innovative features. The data is, for example, used to evaluate the renovation needs, support the process of loan applications and monitor progress of the financing programme.	Link
Det digitale energimærke	Denmark	2006	The national EPC framework, which comprises a public database and innovative features. The database is dynamic as it allows users to easily compare their building with neighbours, or to the whole Danish building stock, and illustrates how much energy could be saved through various renovation measures.	Link
DORéMi	Multiple regions in France	2011	An innovative private initiative that works with regional governments to offer one-stage deep renovations.	Link
Efficiency Capital	Toronto (Canada)	2015	A one-stop-shop offering a customised approach for non-residential buildings, including financing, installation and monitoring. Energy performance contract solution for the cost.	Link
Effilogis	Bourgogne-France-Comté (France)	2012	The regional Effilogis programme helps individuals, social landlords and communities to carry out nearly-zero renovation, in one or several steps.	Link
Effizienzhaus-online	Germany	2013	A private online renovation advice instrument providing a first building check based on user-inserted data.	Link
Eigenheim Manager	Germany	2016	An app that allows homeowners to manage and control energy and economic aspects, such as energy consumption and cost, while storing appointments and vital documents.	Link
Enerfund	EU	2018	A Horizon 2020 project focusing on deep renovation opportunities. It uses EPC data in a dynamic tool to enhance public awareness.	Link



Energieberatung	Germany	n/a	A compilation of German public support schemes focusing on energy audits and checks, for residential and non-residential buildings.	Link
HeizCheck	Germany	2004	A private online renovation advice instrument providing a first building check based on user-inserted data	Link
HERS index	USA	2013	The HERS Index is an easy-to-understand approach to measuring a building energy performance level. Over 2 million buildings have been "HERS-rated".	Link
Home Energy Masterplan	United Kingdom	2009	The private model offers a "masterplan" for the homeowner to reduce energy consumption. The plan is based on a detailed on-site survey. Each renovation option includes a cost-benefit analysis, including energy use and cost, environmental impact and comfort.	Link
Home Energy Score	USA	2012	The U.S. Department of Energy's instrument provides homeowners, buyers and renters with comparable information about a home's energy use	Link
Huizenaanpak	IJmond and Zuid-Kennemerland (the Netherlands)	2014	A Dutch one-stop-shop model that helps building owners to plan, implement and finance their energy renovation.	Link
iBRoad	EU	2017	A Horizon 2020 project developing an individual building renovation roadmap for single-family houses.	Link
Individueller Sanierungsfahrplan für Wohngebäude (iSFP)	Germany	2017	The federal renovation roadmap has been designed to be a user-friendly tool that includes both short- and long-term renovation measures and suggests ways to avoid lock-in effects. The roadmap targets the highest efficiency level that is technically and economically feasible.	Link
Irish "Building Renovation Passport" Ma Rénov	Ireland	2019	Research project analysing and testing the BRP in Ireland.	Link
Oktave	Bordeaux Métropole (France)	2017	A one-stop-shop supporting energy renovation of private homes	Link
Parma Progetto Energia	Alsace (France)	2016	A one-stop-shop offering personalised support on technical, financial and administrative aspects of low-energy renovation projects.	Link
Passeport Efficacité Energétique	Parma (Italy)	2016	The municipality offers technical advice and financial support to carry out energy renovations.	Link
Passeport Energie Habitat	France	2012	A BRP concept developed by a group of building specialists and professionals. The P2E web application is used by the expert to develop a very simple diagnosis of the building and outlines a set of "performance combinations" that would allow that specific building to become a low-energy building.	Link
Picardie Pass Rénovation	Angers Loire Métropole (France)	2015	A renovation roadmap concept in the region of Angers Loire Métropole. The roadmap shows the energy performance level and quality of different components and provides tailored recommendations.	Link
	Picardie Region (France)	2013	A one-stop-shop for homeowners. The model provides the homeowner with a single point of contact, an on-site energy audit, recommendations of how to optimise energy savings, integrated financial solutions and post-installation checks.	Link



Rénoclimat	Quebec (Canada)	2007	A one-stop-shop model in the Canadian region of Québec, which combines technical renovation advice with financial guidance and support.	Link
Sanierungsfahrplan BW	Baden Württemberg (Germany)	2013	The regional roadmap is an evolution of the rather simple energy audit scheme ("Energiesparcheck"), and is based on an on-site audit of the building. The instrument widens the idea of an energy audit by integrating a personalised and long-term perspective as well as a life-cycle approach.	Link
Stuttgart's care-free energy renovation package	Stuttgart (Germany)	n/a	A city initiative that offers a holistic "care-free" renovation package for homeowners, who are interested in carrying out energy renovations.	Link
SuperHomes	Tipperary (Ireland)	2015	A one-stop-shop which supports homeowners with all aspects of the energy renovation process. The customer journey comprises financial guidance, selecting the best energy saving measures, and finding the right contractors.	Link
Woningpas & EPC+	Flanders (Belgium)	2018 and 2019	The Woningpas is a unique integral digital file of each individual building. The logbook comprises all building-related information and makes it possible to track the evolution of each individual building. The EPC+, a EPC equipped with a renovation roadmap, includes recommendations for various elements that accompany a thorough renovation (airtightness, ventilation etc.), and provides a selection of technical information to avoid lock-in effects.	Link