Understanding building renovation passports: customised solutions to boost deep renovation and increase comfort in a decarbonised Europe

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Abstract

Increasing the current EU annual renovation rate from 1.2 % to 2–3 % is essential to ensure a highly-efficient and fully decarbonised building stock by 2050. Increasing building renovation rates while aiming at achieving "deep renovations" is of paramount importance. Building owners face multiple barriers to improve the energy performance of their buildings. Together with difficulty in accessing finance, one of the most often cited barriers is the lack of knowledge about what to do, where to start, and which measures to implement in which order.

Despite their potential, Energy Performance Certificates (EPCs) have a limited market penetration and their acceptance by the users varies across member states. Thus, their relevance for owners and their stimulating effect for the renovation of buildings is limited. While increased thermal comfort and air quality, higher levels of natural lighting and improved health of occupants are among the most important benefits and drivers for renovation, they are not currently covered by EPCs.

Based on three initiatives from France, Belgium and Germany, this paper explores the notion of Building Renovation Passport (BRP) as an evolution of EPCs and initiate a dialogue to promote its introduction across the EU. Aiming at creating a comprehensive and user-friendly instrument to support building owners with personalised instructions on their renovation options, the BRP outlines a long-term step-by-step renovation roadmap for a specific building, resulting from an on-site energy audit fulfilling specific quality criteria and indicators established in dialogue with building owners. Building owners receive a user-friendly, personalised renovation plan, presenting all the expected benefits of renovation, including non-energy benefits. Combined with a logbook, a repository of information on aspects like energy consumption and production and financing opportunities, BRP can become a powerful instrument to boost deep renovation.

Introduction

The European Union is facing a double challenge: increasing building renovation rates while aiming at achieving "deep renovations"[1]. Increasing the current EU renovation rate from 1.2 % per annum to 2–3 % is essential to meet both the EU 2020 targets and the commitment undertaken in Paris in December 2015[2]. About 75 % of the EU's 210 million buildings are not energy efficient, and 75 % to 85 % will still be in use in 2050[3]. Ensuring a highly-efficient and fully decarbonised building stock by 2050 is a major challenge. The quality of the energy renovation of our building stock is, therefore, of utmost importance. Despite the proven economic and technical feasibility of building renovation, and despite the societal and environmen-

1. There currently isn't a common definition of "deep renovation". The European Commission defines deep renovation as at least 60 % energy savings compared to pre-renovation levels (European Commission Staff Working Document (SWD(2013) 143 final).

2. Keeping the long-term increase in global average temperature well below 2 °C above pre-industrial levels, with the aim to limit the increase to 1,5 °C.

3. Impact Assessment for the amendment of the Energy Performance of Buildings Directive, SWD (2016) 414.

tal benefits it could bring, renovation rates are still low and considerably below the expected level.

Building owners and potential investors face multiple barriers to improve the energy performance of their buildings. Together with difficulty in accessing finance, one of the most often cited barriers is the lack of knowledge about what to do, where to start, and which measures to implement in which order.

Energy Performance Certificates (EPCS) could be the appropriate tool to provide this information in a meaningful and comprehensible way. However, they are not designed to provide tailor-made and understandable information about renovation potentials. As a result, they are not usually considered a decisive factor by potential investors and building owners.

EPCs were introduced by the first Energy Performance of Buildings Directive in 2002 (2002/91/EC) with the aim to make the energy performance of individual buildings more transparent. The EPBD recast in 2010 (2010/31/EU) reconfirmed and strengthened the instrument in several ways: independent quality control of EPCs, penalties for non-compliance, a mandatory requirement to hand out a copy of the EPC in sale and rent transactions, the display of the energy label in advertisements and improvement of renovation recommendations (cost-effective and cost-optimal measures).

To date, their implementation varies significantly across Member States in terms of scope and information available, with limited market penetration or acceptance by the users due to low reliability and lack of user-friendliness, raising concerns about the reliability and comparability of EPC. Required recommendations for measures improving energy performance are missing or too general in most national EPC versions. Additionally, EPC-related services such as energy consultancy and audits for residential buildings differ significantly between Member States and programmes[4].

Increased thermal comfort and air quality, better daylight entry and improved health of occupants are also among the most important benefits of renovation[5], but those benefits are not covered by the current EPC formats. As a result, the relevance of EPCs for owners (including potential owners) and their impact in stimulating effect for the renovation of buildings is limited[6].

Two main issues should be solved for EPCs to have a higher impact on energy performance of buildings and renovation: the concerns about reliability and compliance, and their relevance in the decision-making process of building owners. From this perspective, the European Commission's proposal to review the Energy Performance of Buildings Directive missed the opportunity to use EPCs to trigger renovation. Despite putting the consumer at the centre of the "Clean energy for all Europeans" package published in late 2016, the amendments to the EPBD target only a few articles and don't propose any substantial change to EPCs.

On the other hand, a few initiatives have recently started to develop, with the aim of establishing a more comprehensive and user-friendly instrument to support building owners with personalised recommendations on their renovation options. At the core of these initiatives is the idea that renovation plans are very often limited by factors such as financial constraints, the need to reduce the time of renovation, discomfort during the works and the lack of knowledge regarding the best solutions available.

This paper provides an overview of three initiatives developed in Flanders, France and Germany[7], all revolving around the concept of "Building Renovation Roadmap" or "Passport".

These initiatives were chosen for their advanced phase of development (they will soon enter the implementation phase), as they provide a good overview of the process supporting the creation of a Building Renovation Passport and as they cover the main issues that need to be addressed for its development and implementation.

The paper will explore the notion of "Building Renovation Passport", introducing the concept and its main features, and will provide an insight on the step-by-step approach developed in Flanders to ensure the regular involvement of stakeholders and the inter-institutional cooperation along the process.

What is a Building Renovation Passport?

There is no common definition of Building Renovation Passport (BRP). Each of the examples considered differs in some elements and the terminology used. The definitions presented below are based on the main findings of the cases analysed.

Figure 1 presents an overview of the main components of the BRP to provide a common understanding of the terminology and the different elements forming the BRP.

A **Building Renovation Passport** is defined as a document – in electronic or paper format – outlining a long-term (up to 15 or 20 years) *step-by-step renovation roadmap* for a specific building, resulting from an *on-site energy audit* and fulfilling specific quality criteria and indicators[8] established in dialogue with building owners. The expected benefits in terms of reduced heating bills, comfort improvement and CO_2 reduction are a constitutive part of the BRP and are explained in a user-friendly communication. The renovation roadmap can be combined with a repository of building-related information (*logbook*) on aspects such as energy consumption and production, executed maintenance and building plans.

On-site data gathering is the first step towards the creation of a BRP. The data processing can change per each model (e.g. by using a dedicated software or by adapting the existing energy audit software). The outcome of step 1 and 2 is a comprehensive step-by-step renovation roadmap, with tailored solutions aiming at achieving deep-staged renovation.

STEP-BY-STEP RENOVATION ROADMAP (OR STAGED RENOVATION)

A step-by-step renovation roadmap is a renovation plan with a horizon of up to 15–20 years that, by looking at the building as a whole, suggests the installation of selected measures in a

4. BPIE (2014): Energy Performance Certificates across the EU.

5. IEA (2015): Capturing the Multiple Benefits of Energy Efficiency; BPIE (2015): Indoor air quality, thermal comfort and daylight.

6. According to the ZEBRA2020 survey: the real-estate market does not see a link between the improvement of the energy performance of buildings and EPCs.

7. "Woningpas" (Dwelling ID), "Passeport Efficacité Énergétique" (Energy efficiency passport) and "individueller Sanierungsfahrplan" (individual renovation roadmap).

8. E.g. energy consumption, daylight, indoor air quality, health conditions, thermal comfort, acoustic comfort, cost.

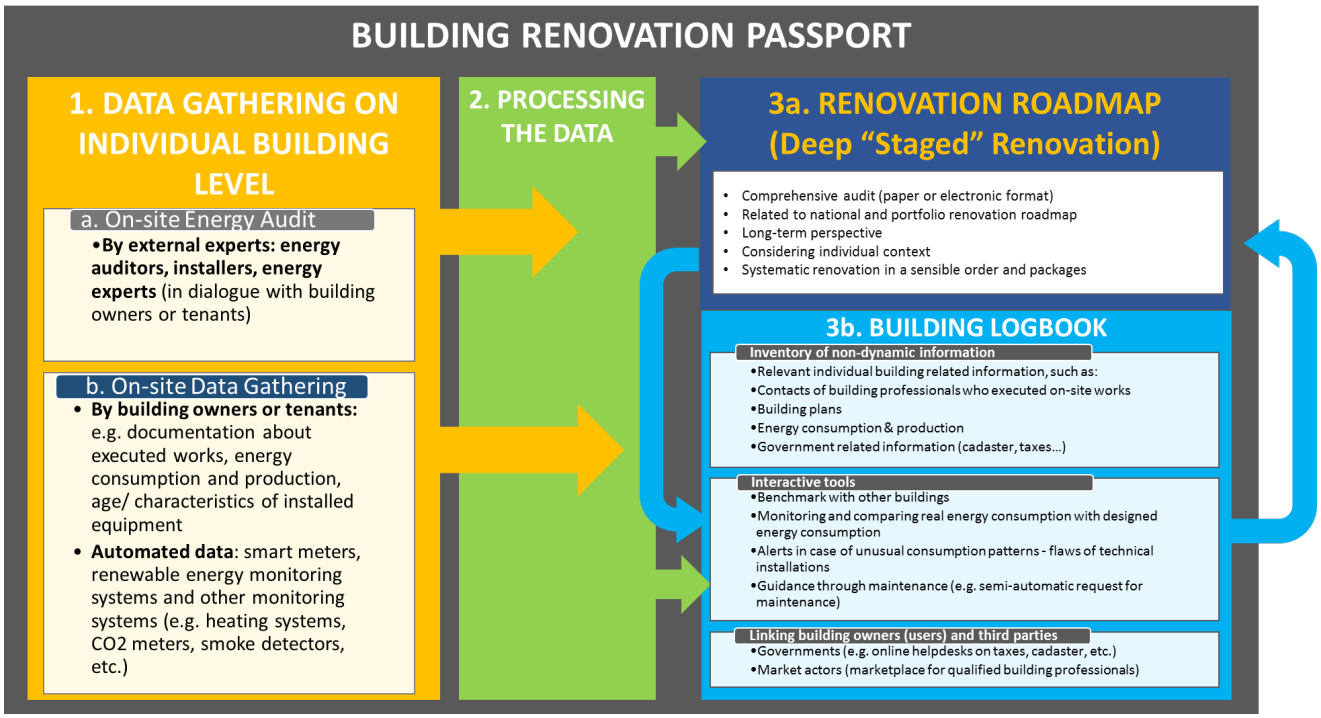

Figure 1. Building Renovation Passport – overview of its component (source: BPIE).

certain order (sequencing) to avoid that at any stage of renovation the installation of additional measures is precluded (lock-in effects[9]).

DEPTH OF RENOVATION

There is no common definition for "deep renovation" and "deep-staged renovation"[10].Each of the examples analysed uses a different definition. There are, however, common features among these initiatives, like the will to raise the level of ambition for achieved energy performance, to ensure consistency between short and long term measures and to align the target for the performance of individual buildings with the long-term target for the entire building stock.

By supporting staged renovations, adapted to the preferences of individual building owners, BRPs give them the opportunity to have an overview of the full range of renovation options and to easily identify each renovation step from beginning to the end. Staged renovation strategies facilitate the owner's decision to invest in a deeper renovation process especially if specific elements that need to be considered for later renovations are also highlighted. For example, if a roof is insulated, roof overhangs, downspout connections, adjustment of the boiler and piping penetrations for future solar systems, etc. are also included.

The final product is a **Renovation Roadmap** outlining each step and the links between all measures implemented, presenting the renovation as a home-improvement plan (not just a technical intervention) and taking into consideration the occupant needs and specific situations (e.g. age, financial situation, composition of the household, etc.). The renovation roadmap will therefore be specifically tailored to each homeowner (e.g. a young family or an elderly couple may have different needs and financial availability).

It is essential for owners to take possession of the project: the uncertainty regarding future renovation options typically leads to a lower number of renovations or to limited renovations (installation of easy measures). Any instrument that triggers a long-term perspective and allows building owners and potential investors to clearly outline robust renovation plans, including short-term measures and measures that need a more adaptive and flexible approach (e.g. sequencing of measures installation over time) could increase their confidence and enhance the rate and depth of renovation.

BRPs provide a comprehensive set of relevant indicators (e.g. energy consumption, CO_2 emissions, thermal and acoustic comfort, indoor air quality and daylight) and include a dynamic dimension by delivering information about recommended improvement strategies in a detailed way and, by doing so, stimulate deep or staged deep renovations.

LOGBOOK

In addition to the renovation roadmap, the building renovation passport can also include a separate element, a storage space where the building's features and information (e.g. stability plans, BIM, water consumption, installations, humidity, maintenance requirement, etc.) can be collected and regularly updated, becoming a proper repository of information and data related to a specific building. The type of information stored in

9. This term refers to the fact that once some basic energy efficiency measures have been implemented, it becomes less cost effective to fit more comprehensive measures in the future (European Commission, 2014). The IEA also defines lock-in effect as "the energy savings which are not going to be realised due to un-ambitious and insufficiently stringent energy requirement targets for buildings, building element and equipment" (IEA Glossary).

10. BPIE suggests a threefold approach to achieve deep staged renovation: a) define the targeted high energy-performance level (e.g. 75 % energy reduction or fixed amount of kwh/m²/a); b) identify the necessary set of energy-saving measures to reach the target, c) followed by a renovation planning in different phases, tailored on individual buildings and specific situations (e.g. building characteristics, subsidy availability, desired renovation time, owner's financial constraints).

the logbook for each individual building can increase overtime and could range from financing options available in the area for renovation projects (e.g. green loans, incentives, tax credits) to energy bills, smart meter data, equipment maintenance recommendations as well as insurance and property obligations. All this information could be inventoried in a digital register, available to property owners and, under specific conditions, to other relevant users (e.g. public authorities).

LOGBOOK USER

The main user of the logbook is the building owner. Depending on the type of logbook or its intended use, access to some information could also be granted to public authorities (e.g. municipality, property tax office), building professionals and craftsmen. Some information could be publicly available, while other data would remain private or restricted (semi-public upon authorisation to third-parties).

All the models analysed for this paper are still under development and only the Flemish example plans to include a logbook in its Building Renovation Passport: in Flanders, where the first version of the logbook is planned for 2018 (see Figure 5), building owners will have access to the logbook, with the opportunity to authorise access to public authorities.

In a more sophisticated form, the logbook could also be used as an interactive tool to monitor (both at individual building level and building stock level) and compare real energy consumption with designed energy consumption, send alerts in case of unusual consumption patterns or flaws in technical installations. It could also be linked to market actors (such as building professionals, craftsmen or financial institutions) to provide information regarding (qualified) contractors and installers, facilitate invoicing and simplify the process for subsidies or loans repayment (see Figure 1, 3b).

Issues such as the ownership and update of the logbook and the transfer of data between building owners and potential buyers (including private data between a home owner and commercial companies, like quotes for installation of measures or plans for renovation from an architect) should be explored and addressed based on national obligations and existing regulatory frameworks.

TARGETED BUILDING TYPOLOGY

The three examples in this paper target residential buildings, with a focus on single-family houses, and provide a tailor-made renovation plan and customised recommendations to building owners in an attractive and motivating form. In principle, BRPs could also be adapted to other building typologies (e.g. multi-family, public and commercial buildings).

FIVE KEY PRINCIPLES AT THE BASIS OF THE BUILDING RENOVATION PASSPORT

In addition to the common trends identified above, five common guiding principles can be identified as the basis of the building renovation passport. Each principle is a cornerstone for the development of Building Renovation Passport and is considered essential in all the cases presented:

1. *Long-term perspective:* the integration of a long-term thinking is essential for the success of building renovation passports, since they aim at helping the owner to carefully plan for renovation in a consistent manner, achieve a high-level of energy performance over time and better control the total cost of renovating.
2. *Timing and sequencing of actions:* building renovation passports include both short-term and long-term measures and clearly indicate the correct order in which to install them (e.g. sequencing of the measures' installation over time) to avoid lock-ins, increase building owners' confidence and enhance the rate of deep renovation. Passports therefore address uncertainty regarding future renovation steps, which typically lead to retention with respect to renovation decisions or to limited renovations (installation of short-term measures).
3. *Customer engagement and consideration of the individual renovation context:* The wishes, needs – in particular expectations regarding comfort – and the financial situation of the occupants must be considered. These include, for example, financial opportunities, living space changes and family planning (e.g. having a baby, or children moving out). In all the study cases, the fact that the owners take ownership of the project is seen as a key success factor.
4. *Attractiveness and motivation:* BRPs should be very attractive and user-friendly. Building owners have to be guided throughout the process and receive clear indications so that they can confidently take action without being discouraged by the complexity of the renovations. The visual graphics of the BRPs must therefore be carefully designed and easy-to-understand.
5. *Automation:* experts should be able to perform the audit and deliver the results as easily as possible. The instrument offered to the auditors (e.g. software) to input data during the audit should be structured in modular blocks, indicate default values and highlight errors in case of wrong inputs, etc. Once the audit is concluded, an automated information sheet (including text and figures) can be filled with specific property parameters. This facilitates the energy auditors' work while delivering personalised advice at the same time.

WHAT KEY PERFORMANCE INDICATORS FOR A BUILDING RENOVATION PASSPORT?

While the list of indicators that will be included in the three case studies is not yet available, an increased interest in the notion of comfort was clearly expressed, not only from a quantitative point of view, but also in a qualitative way (how to express comfort in a way that is understandable for the user, how to consider the user's perceived level of comfort during the expert's on-site visit, etc.). BPIE has developed a list of potential performance indicators that could be included in a Building Renovation Passport and support the development of step-by-step renovation roadmap, in cooperation with experts and building owners.

Overview of three models: Flanders (Belgium), France and Germany

The region of Flanders in Belgium, France and Germany have developed the concept of "building renovation roadmap or passport" and while they have not yet started implementation,

Energy consumption

- Primary energy consumption kWh/m²year (heating, DHW, cooling, fans, pumps, control)
- Final energy consumption kWh/m²year (heating, DHW, cooling, fans, pumps, control)
- Net energy consumption kWh/m²year (heating, DHW, cooling)
- Energy need for Heating & Cooling kWh/m².year
- Energy consumption of lighting system kWh/m².year
- Building heat transfer coefficient (U value)

Indoor climate

- Indoor air temperature °C
- Indoor air relative humidity %

Airtightness and Ventilation

- Type of ventilation system
- Air exchanges rate (ACH)
- Efficiency of heat recovery (if available OR applicable)
- Building airtightness by 50Pa (ventilation)
- Building airtightness by 50Pa 1/h (infiltration)

Indoor air quality

- Indoor air quality (IAQ) indicator: ACH or CO_2 concentration in indoor air above outdoor concentration in PPM, for different categories in accordance with EN 15251 "Indoor environmental input parameters for design and assessment of energy performance of buildings- addressing indoor air quality, thermal environment, lighting and acoustics"
- CO2 concentration in indoor air in PPM
- PM and TVOC content in indoor air

Noise insulation

- Sound pressure level dB(A) in living room and bed room

Artificial lighting

- Type of lighting
- Power of lighting W/m²
- Spatial light distribution

Daylight

- Daylight factor
- Daylight autonomy
- Useful Daylight Illuminance

CO_2 emissions

- Equivalent CO_2 emission in kg per year per m², kg CO_2/m²year (heating, DHW, cooling, fans, pumps, controls)

Thermal comfort - Qualitative

- Use of scale/colour code to express: Cold - extremely uncomfortable, Cool - uncomfortable, Slightly cool- slightly uncomfortable, Neutral - Comfortable, Slightly warm - slightly uncomfortable, Warm - uncomfortable, Hot - extremely uncomfortable

Thermal comfort - Quantitative

- With the use of PPD and PMV (EN ISO 7730) for four different categories of comfort levels in accordance with EN 15251 standard

Figure 2. List of potential performance indicators included in the Building Renovation Passport (source: BPIE).

they provide a good overview the key features of the Building Renovation Passport as well as the main issues that need to be addressed for its development.

Several key elements and common trends emerge from the comparison of the three cases:

- *Voluntary tool*: Building renovation passports are developed as a voluntary tool, complementary to the EPCs;
- *Political support*: Public authorities in Flanders, France and Germany have shown interest for this concept and supported its development. The German government is supporting the preliminary work to introduce the individual renovation roadmap in the country (based on the results of a pilot in Baden-Wuerttemberg) and in France, the Energy Transition Act (Loi de Transition Energétique et pour la Croissance Verte) mentions that a digital notebook (carnet numérique) has to be deployed by 2017;
- *Ambition (long-term target for existing stock)*: In France, Passeport Efficacité Energétique (P2E) has adopted a definition of deep renovation (corresponding to BBC[11] level of renovation to be achieved by 2050, equivalent to 80 kWh/m² of primary energy per year, including heating, hot water and cooling), while Flanders refers to the notion of "long-term efficiency" (an energy efficiency level to be achieved by 2050) and Germany has introduced the "best possible principle", which establishes that auditors have to recommend the most ambitious measures to achieve the efficiency level established for the building stock and must justify any deviation from the best standard;
- *Stakeholder engagement*: All have identified the main barriers to deep renovation in their market, mapped the main stakeholders and regularly involved them in the design of the renovation roadmap;
- *On-site audits*: All three concepts have on-site energy audits (performed by qualified energy auditors) as the first step towards Building Renovation Passports and tailored solutions as one of the main featured results;
- *Building Type:* Building Renovation Passport target single family homes[12].
- *Dialogue with building owners*: Building owners are at the centre of the three approaches and invited to a dialogue with the auditors;
- *Training*: Training for the auditors is offered as part of the process to establish a Building Renovation Passport in France and Germany. In Germany, training also includes communication skills and the life-cycle approach of building elements.
- *Logbook*: Flanders foresees the full development of the building logbook as part of the BRP, while in France, P2E will contribute to the Energy Performance and Renovation Component of the so-called 'Carnet numérique de suivi et d'entretien du batiment'[13] developed by the government[14]. Germany has not planned to include the logbook in the Individueller Sanierungsfahrplan (iSFP);
- *A new way to measure comfort*: All three concepts have included indoor air quality and comfort level among the main indicators, but it is not yet clear how they will be accounted for. All three models are exploring a new way to measure comfort. Both in Flanders and Germany this indicator will be measured not based on technical calculations, but in a more subjective way[15]. In France, P2E is also considering the adoption of a mixed approach, combining technical elements with subjective criteria. By using "permanent feedback" from the upcoming pilot implementation, P2E intends to adapt its criteria based on the lessons learnt on the ground during the implementation;
- *Performance indicators*: Most of the performance indicators are presently under development or undergoing an internal approval. Thus, the technical details are not publicly available[16];
- *Upcoming implementation*: The three models will start the implementation phase between 2017 and 2018. None of the models is available on the market yet[17].

INSIGHT ON THE FLEMISH CASE

The three models considered have completed their design phase, but their implementation is still at an initial phase. This section presents an insight on the process set up by the Flemish Energy agency (VEA) to ensure that all the necessary steps for a proper development and implementation of their model are in place, e.g. users' feedback, inter-ministerial collaboration and secured financing. This step-by-step approach allows the roll-out of the programme based on a pre-determined set of steps, each associated with an indicative timeframe.

The Flemish example provides a broad overview of the necessary steps for the creation of a Building Renovation Passport and a good example of stakeholder engagement and inter-institutional cooperation along the process.

In cooperation with a wide network of stakeholders, VEA is developing the so-called "Renovation Pact" that should lead to a thorough improvement of the energy performance of the Flemish housing stock: by 2050, the existing building stock should become as energy-efficient as new buildings today (E60). One of the main actions foreseen in the pact is to create a "renovation advice" (renovatieadvies), integrated with a first version of the digital logbook (called Building Passport Light) by 2018. The renovation advice will provide a roadmap to help building owners to make a thoughtful, forward-looking plan for their renovation, while the digital logbook will collect data on energy performance, housing quality, building features (sta-

11. Bâtiment Basse Consommation (Low-Energy Building).

12. BRP may be adapted and extended to other building types, like multi-family dwelling in the future.

13. Digital logbook for building maintenance and information.

14. Loi n° 2015–992 du 17 août 2015 relative à la transition énergétique pour la croissance verte.

15. Detailed information about how this would be captured is currently not available.

16. March 2017.

17. Individual building renovation roadmaps are available in Baden-Württemberg, but a new concept has been developed by the German government.

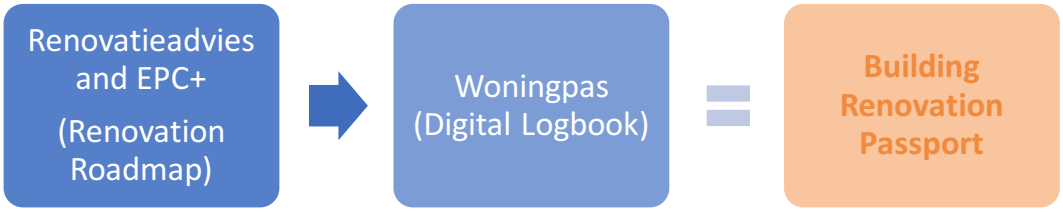

Figure 3. The two main elements of the Flemish Building Renovation Passport.

bility, durability, water, installations, humidity, etc.) and other data related to the property that the building owner can safely collect and save.

The Flemish Building Renovation Passport is composed of two main elements: the renovation roadmap, called renovation advice (renovatieadvies) and the digital logbook, called building passport (woningpas).

Renovation advice and EPC+ (renovatieadvies)

Two major groups have been identified as the main beneficiaries of the renovation advice: building owners and prospective buyers and tenants. Since the needs of the two groups are different, VEA tailored the instrument by diversifying between the renovation advice (targeting property owners) and EPC+ (targeting potential property buyers and tenants).

The renovation advice describes the actions that the owner should take to bring the current energy performance of the property to the level established by the long-term objective (E60 in 2050). It allows the owner to choose between completing the renovation in one go or doing it in stages while avoiding lock-in effects. The staged renovation advice takes the specific situation of the property owner (age, family situation, duration of the renovations over time, existing planned renovation, etc.) into account and includes an estimation of the cost and the payback time of the proposed measures. The information is delivered by an energy expert.

This instrument will also be promoted on a larger scale, in order to increase awareness around building renovation and alert owners to the benefits and opportunities of staged renovation. VEA estimates that over 10,000 dwellings per year could adopt the tool when it is rolled out and fully implemented.

The EPC+ is an enhanced version of the EPC aiming not only at informing potential building buyers of the energy value of a property, but at providing them with a very clear picture of what is needed in order to achieve a future-proof energy-efficient standard (E60 by 2050). The potential buyers will be informed on the best options for the energy renovation of the property they are interested in. In the future information about the renovation-roadmap towards the long-term energy objective will be automatically generated by the EPC caluclation software and EPC will evolve into EPC+.

Building Passport (woningpas) – Digital logbook

In parallel, VEA is also developing a digital logbook (woningpas) to accompany the renovation advice and EPC+. The logbook is a unique digital document for each (residential) building, that can be consulted by the property owners and authorised third-persons (e.g. craftsmen, architects, energy experts, notaries). It will collect information about the long-term evolution of each house and include data covering energy, housing quality and building features. The primary user of the logbook is the owner, who will be able to grant permission to make certain information publicly available and keep more detailed data restricted (semi-public upon authorisation to third-parties). Building owners will also be able to visualise their energy consumption, as well as the potential savings and the proposed roadmap.

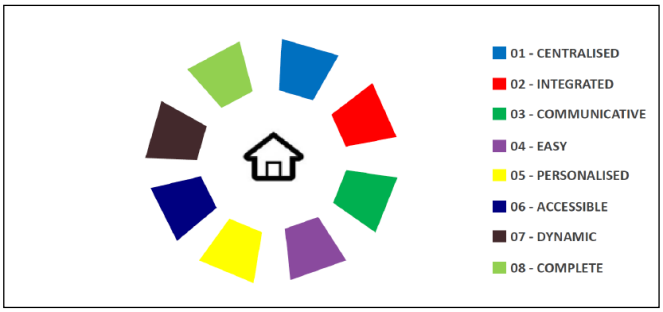

Figure 4. Characteristics of the woningpas (based on input provided by VEA).

The ability to add new elements and information to the passport over time is crucial. For this reason, the logbook is designed to have a **modular structure**. A successful building passport is constantly updated and fed with new inputs.

Another main feature of the digital logbook is the ability to provide an overview of all required and available certificates as well as necessary inspections in one page, a sort of checklist to get an insight on the quality and characteristics of the building. When considering that in Flanders the owners and the authorities count about 150 interactions[18] to get all permissions for construction and renovations in order, having all the certificates and permissions in one page will lift a considerable administrative burden for both the owners and the public administration.

This would also result in a benefit for a prospective buyer, seller or tenant to get a first glimpse of the building, upcoming inspections or required maintenance, as well as the expected administrative tasks to be completed.

The credibility of the 'Building Passport' and reliability of the data are two key elements for the success of this instrument and linking it to trustworthy and secured sources managed by the government (for example, certificates and inspections) is critical.

Inter-institutional cooperation

Accurate planning, partnering with key institutional players sharing competences concerning buildings (e.g. issues like safety, spatial planning and energy are dealt with by different

18. VEA estimate.

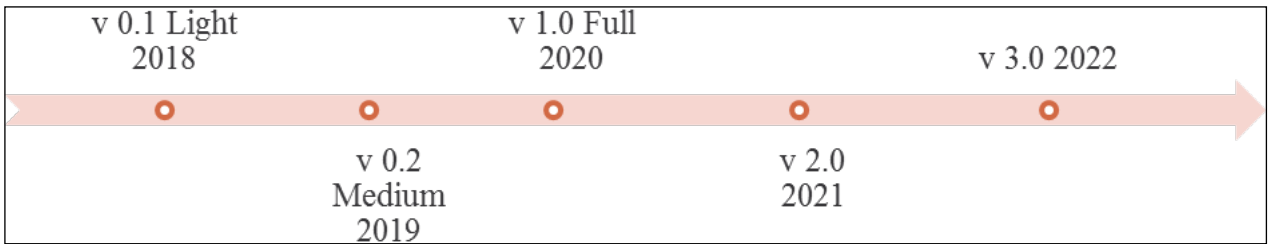

Figure 5. Roadmap Woningpas (source: VEA).

ministries) and stakeholders and ensuring financing are all essential elements for the success of the Building Passport.

In late 2016, a formal agreement was signed among VEA and the Ministries of Energy, Housing and Environment (which hold different competences related to buildings) to secure the development and the funding of the digital logbook following the roadmap presented below. Since all relevant information regarding building construction, renovation and transactions are managed and stored differently by each of these entities, the agreement is de facto the first formal step towards the implementation of the digital building passport in Flanders.

The implementation foresees the introduction of different modules overtime, from the first simplified version (Building Passport Light) in 2018 to its full deployment in 2022. For each module (or version), a series of features and steps to guarantee feedback have been identified:

1. Light: Integration and retrieving of certificates, activities to inform the citizen and users' feedback.
2. Medium: requirements and authorizations, check-tool for dwelling quality, ability to upload documents.
3. Full: link with renovation advice & update, link to tailored grants and loans.
4. Version 2.0: all parts are connected, reporting to policy makers.
5. Version 3.0: integration to smart meters and smart buildings, automatic advice function enabled.

A number of preparatory steps will be complete before the launch of the Building Passport Light, including a legal and technical research to identify which data and information can be legally shared by which party and explore the technical feasibility of data sharing among the different ministries and organisations currently holding them. The research will then be followed by the technical development and testing of the application allowing to link all these data and transfer them to the digital building passport.

Advantages of a complete Building Renovation Passport (renovation roadmap and digital logbook)

While in other cases the renovation roadmap and the digital logbook are considered separately (or not considered, like in Germany), VEA has clearly indicated its intention to link the renovation advice (which will be develop in parallel and launched in 2019) and the building passport and is planning accordingly.

Some of the main advantages identified by VEA[19] for doing so are multiple, including:

- Minimise administrative burden during key events, like building construction, renovation or purchase/sale.
- Regularly update data and information regarding the building stock, including the ability to upload up-to-date information in the digital logbook and share it with relevant stakeholders and public authorities (upon approval of the building owner).
- Automatically link the awarding of financial bonuses and incentives to the work carried out (once the information is uploaded/updated in the logbook).
- Ability to create an open system to link with other activities or platforms like the Smart Building initiative and real estate websites and to link data about renovation with databases on qualified workers, quality of executed works and the products offered on the market.
- Ability to keep track of the progress towards the 2050 goal for the building stock.

In the long term, the data collected through the renovation advice and the digital logbook could also be used to plan for district renovations, by creating partnership between the public authorities, groups of building owners and the construction sector (e.g. building companies, equipment providers).

Conclusions

In recent years, the concept of Building Renovation Passport has been gaining attention as a way to achieve higher (and deeper) renovation rates. The upcoming review of the Energy Performance of Buildings Directive creates the opportunity to introduce this concept as a useful tool to be included in national renovation strategies and to strengthen the use of EPCs with the aim to make them an effective instrument for consumer and investor guidance. In their current application, EPCs are not considered a suitable instrument to increase renovation rates, since they rarely provide personalised recommendations about renovation options. For this reason, they are either not taken into account (like in Germany), or just used as a reference (e.g. P2E) for BRPs.

19. VEA (2016) Building Passport.

The Clean Energy for All Europeans policy package published in November 2016 puts a lot of emphasis on consumers and their ability to actively participate to Europe's energy transition and on the protection of vulnerable consumers, but the proposed revision of the EPBD doesn't include any provision encouraging the evolution of the EPCs.

Building Renovation Passports offer the opportunity to empower consumers and to support them in taking informed decision pertaining to building renovation, an area where they usually have limited influence, which requires a level of technical knowledge foreign to most and where decisions are often based on financial availability. To be successful, it is critical to properly design this instrument and address issues like ownership, confidentiality and transfer of data, as well as the regular and automated update of the logbook data (homeowners may not be able or willing to update it). At the same time, the challenge of using a voluntary tool to motivate individuals to renovate, warranting its dissemination and ensuring that progress toward long-term goals is accurately monitored shouldn't also be underestimated.

According to Vice-President of the Energy Union Maroš Šefčovič, the measures proposed in the Clean Energy for all Europeans package "will equip all European citizens and businesses with the means to make the most of the clean energy transition."[20]

Four of the five common guiding principles at the basis of the Building Renovation Passport relate directly to the objectives[21] of the package. Engaging customers and considering their specific situation to ensure the advice they receive is personalised and provides both a long-term perspective and suggestions about the right timing and sequencing of action, will contribute to drive the EU towards a clean energy transition and promote a better involvement of consumers.

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20. European Commission (2016), Clean Energy for All Europeans – unlocking Europe's growth potential, Press Release.

21. Putting energy efficiency first, achieving global leadership in renewable energies and providing a fair deal for consumers.