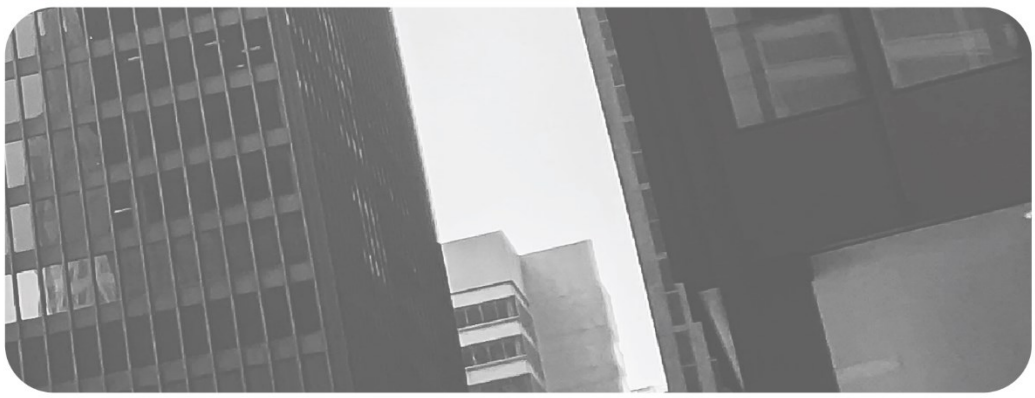
D2. 3 Report on users' perception on EPC scheme in

U-CERT partner countries



U-CERT
User-Centred Energy Performance Assessment and Certification

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List of abbreviations used in this document

CEN: European Committee for Standardization

EE: Energy Efficiency

EPBD: Energy Performance of Buildings Directive

EPC: Energy Performance Certification/-ate

HVAC: Heating Ventilation and Air Conditioning

IEQ: Indoor Environmental Quality; concept encompassing indoor air quality (IAQ), as well as other health, safety, and comfort issues such as thermal comfort and lighting (glare prevention, lighting levels, ...).

ISO: The International Organization for Standardization; a worldwide federation of national standards bodies (ISO member bodies).

LCA: Life Cycle Assessment

LCC: Life Cycle Costs

MS: EU Member State(s)

nZEB: Nearly Zero-Energy Building; building that has a very high energy performance, as determined in accordance with Annex I (of EPBD Directive 2010/31/EU). The nearly zero or very low amount of energy required should be covered to a very significant extent by energy from renewable sources, including energy from renewable sources produced on-site or nearby.

QA/QC: Quality Assurance & Quality Control; the combination of quality assurance – the process or set of processes used to measure and assure the quality of a product – and quality control – the process of ensuring products and services meet consumer expectations.

ROI: Return on Investment

SRI: Smart Redlines Indicator. EPCs should have the capacity to increasingly reflect the smart dimension of buildings by means of digital supporting tools. An important part of this is the calculation methodology Smart Readiness Indicator for Buildings, which will allow for rating the "smart readiness" of buildings – the capability of buildings to adapt their operation to the needs of the occupant, optimizing energy efficiency and overall performance, and to adapt their operation in reaction to signals from the grid. The SRI should rise awareness amongst building owners and occupant of the value behind building automation and electronic monitoring of technical building systems. It should also invoke confidence in occupants, providing them fact-based information on relation between (potential) savings and EPCs' enhanced functionalities.

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1. Executive summary

Key aim of Deliverable 2.3 – Report on users' perception about Energy Performance Certification (EPC) scheme in U-CERT partner countries – is to demonstrate the results of the *Task 2.3 – Roll out of the analysis of users' perception.* The task is closely related to Task 5.3, which drew upon the same set of qualitative data and focused on identification and categorisation of end-users needs for U-CERT services and business models. T5.3 finished with the *Deliverable 5.3 – Catalogue (report) of users and beneficiary profiles for tool development for Task 5.4*. Task 5.3 had a specific focus on profiles of EPC experts and users, defining needs and expectations for each of the profiles individually. In contrast, T2.3 aims at interpreting all of the gathered perspectives and feedback in topical chapters with the aim to **identify key features of next generation user-centred EPCs**.

As such, D2.3 gives the data a different structure, focusing on specific aspects of EPC schemes, such as user-friendliness, quality, cost-effectiveness, wide base support, and comparability. Tasks 2.3 and 5.3 can therefore be seen as complementary, presenting data from two different yet indivisible angles. Outcomes of both tasks will help accelerating development of digitalized tools that will support key stakeholders in EU member states with implementation of the new generation EPC schemes.

Research associated with Task 2.3 addresses the key aim of U-CERT project in the following points:

- Provides inputs for development of the next generation EPC schemes to being optimally user-centred and user-friendly,
- Encourages development and application of holistic innovative user-centred solutions,
- Interprets experience with the existing EPC schemes across the EU,
- Provides reference points for understanding the role (and potential) of EPCs in people's decision-making processes (e.g. on deep renovation),
- Provides reference points for development of U-CERT tools to encourage and support widespread investments into improvement of Energy Performance of Buildings,
- Provides insight into implications of EPCs and Energy performance of buildings related policies, including aspects of trust, relations between key stakeholders and dynamics of socio-cultural value ascribed to buildings and related energy performance aspects, and
- Provides insights from a user perspective, creating space for sharing implementation experience valuable to all stakeholders involved in the implementation of the next generation EPCs, which is being applied in associated tasks facilitated and empowered by the EPB Center.

The key takeaways from U-CERT ethnographic research presented in this report are:

Existing EPCs

- Existing EPCs have a very **different purpose and value depending on the specific viewpoint we take** – be it institutional, expert or user's viewpoint.
- **Existing EPCs do not function as a benchmark for quality housing.** With exception of few well informed and/or enthusiastic individuals, businesses and institutions, the majority of people **do not consider existing EPCs as a relevant** reference point **when buying or renting a property.**
- **Access to systematic (public) funding** for energy efficiency measures has been pointed out particularly on the institutional levels **as a key driver** of demand for EPC products and services.

- **Education of EPC issuers and their professional performance, particularly in their interaction with clients,** have often been reported as **one of the principal weaknesses** of existing EPC schemes. As such, these aspects must be seen as important factors regarding perceived quality of EPC schemes, and furthermore, as an integral part of EPC product and services.
- **Quality control** over the **method**, work of EPC **issuers**, and overall compliance with existing regulation in the construction sector has also been reported as **one of the principal weaknesses** of the existing EPC systems. Considering criteria of necessary effort and impact it is also seen as one of the **best leverage points for fast and effective improvements** of EPC schemes in the future.
- Notions of **trust, reliability, awareness and knowledge** are central to perceptions of existing EPCs. People often tend to **avoid action** related to investments and improvements of their property for a variety of reasons, including aversion to change, costs and disruption of life, lack of knowledge and interest, lack of insight into benefits and opportunities, distrust towards key stakeholders involved in the certification process etc.
- Public authorities and energy experts/EPC issuers are keen to engage in **activities of knowledge and experience transfer** on both national and international levels.

Future EPCs

- **New EPC schemes** and related business models **will be successful** as a user-centred concept *only* **if their value will be recognized by non-experts.** In other words, if we want to make EPCs a user-centred product, they must be established and recognized as a useful tool in service of the people in their everyday life.
- **EPC products and services alone, as a goal in themselves, are not enough.** For optimal balance of quality, cost-effectiveness and acceptance, future EPCs need to be **integrated with the broader context** - firstly by defining differences and touchpoints with related concepts, services and products (such as BIM, energy audit, inspections of building services, building renovation passport, Smart Readiness Indicator, Building Digital Logbook etc.), secondly by means of innovative business models promoting and streamlining investments in building performance improvements (energy, environmental, Indoor Environmental Quality), and thirdly by integration with exiting and developing technologies.
- The quality of **user experience of EPCs** for general population is strongly dependant on **design aspects**, such as visual (graphical) representation, content (complexity and contextualization of data), language used, availability of auxiliary services (customer support), quality of certification services (interaction with EPC issuers) etc.
- Future EPCs should **make energy more intuitive and influence behaviour** of building users, indicating aspects which are largely being neglected or not represented clearly in the existing EPC schemes. These include health, safety, convenience, well-being, comfort etc.
- **Future EPCs should accommodate a wide scope of use** by offering **several levels of complexity of user interface** – for example basic, intermediate, advanced and expert. In combination with digitalisation, EPCs could adopt a modular design enabling users to **tailor their EPCs** to their needs and interests. Furthermore, digitalized EPCs could also offer interactivity with the built environment (including SRI) and potentially **moderated learning** progression of users, primarily by measuring the actual building performance and making the invisible aspects of human-building interaction visible and contextualized.

- The success of policies and schemes, such as the EPC scheme, largely depends on **efficient coordination and collaboration between key stakeholders**, **strong public awareness**, **and practical (real) value** of the EPC scheme that makes it meaningful and useful for the wide range of stakeholders and users.
- Future EPC schemes need **positive promotion and publicity** supported and generated by designated strategic promotional and marketing strategies and funds.

Some of the identified key features of the next generation user-centred EPCs are:

- **Improve the design of EPCs**
  - **Enable adjustments to complexity of EPCs** (density and characteristics of information, including language and indicators) according to the type of EPC users (knowledge, needs, expectations, interests), type of buildings (according to physical characteristics and purpose of use) and patterns of use (accounting for human-building interaction patterns, habits and culture of use etc.).
  - **Provide clear relations** between different pieces of data and information included in the EPCs.
  - Contextualize **energy use** (and costs and IEQ).
  - Enable meaningful **comparison with other buildings.**
  - Enable more efficient **human-building interaction** (use and management) by communicating key aspects of energy performance, health and IEQ.
- Include **typical user profiles**
- **Make EPCs a starting point** (roadmap) of maintenance and renovation that triggers the decision-making process, facilitates planning of (deep) renovation projects, and serves as a follow-up reference point for assessing the overall success and efficacy of the interventions.
  - Refer to the **unique condition** of one building.
  - Provide meaningful improvement measures and renovation guidelines.
  - Suggest viable **case-specific building performance improvement measures** with reliable and transparent estimation of resources and impacts (optimized cost-effectiveness of energy efficiency actions)
  - Propose an overarching evidence-based module for **measured** building performance.
- **Make EPCs into a living document/database** aiming to ease the decision-making process towards energy renovation actions.
  - **Promote widespread renovation** of the existing housing stock.
  - **Streamline and support** the implementation of building performance improvement actions.
  - Promote and support good quality construction and energy-efficient performance of all new and existing buildings.
  - Update EPCs periodically.
  - **Digitalise EPCs.**
  - **Enable real-time monitoring** (access to information) on energy use and IEQ to influence people's practices of energy consumption and use.
  - **Enable normalized performance of building services (e.g. space heating) synchronized** with weather and use patterns data.
  - **Integrate and rely on EPCs in the building maintenance, technical monitoring and quality management processes** of the future.
  - Include elements of **Smart Readiness Indicator**.

- **Make EPCs a benchmark** for assessing **quality housing** and properties both in terms of financial value and quality of use.
    - **Tie estimation of quality to health and wellbeing of users.**
    - Establish energy **efficiency, environmental performance, and IEQ as a reference point** for real-estate trade.
    - Include **meaningful and reliable financial indicators** leveraging EPCs as a tool for bridging the current technical-financial gap.

2. Introduction

The existing EPC schemes and their development is often being described by experts and professionals – as well as being publicly promoted – as a user-centred project. According to our research, however, practice is in stark contrast to such claims. U-CERT research finds that existing are designed with a strong bias towards the expert needs and expectations, or perhaps even more so, the needs of the underlying policies and structures implemented in relation to the EPBD directive issued by the EU Commission. As such, they offer general users little more than a sense of fulfilled "administrative necessity".

From the essentially systemic – expert – perspective, EPCs are expected to present a quantitative reference point for energy use in buildings. An individual EPC only really makes sense as a quantifiable data set used for building clusters analysis. In contrast, from the pragmatic and localized – user – perspective, EPCs are expected to present a qualitative reference point. An individual EPC should refer to the unique condition of one building and enable meaningful comparison with another building. It should present their users with useful information, such as contextualized energy use (and cost), to help them interact with (or manage) the building in a more energy efficient manner. In addition, it should suggest viable case-specific measures to improve the Energy performance of the building. Finally, it should also serve as a benchmark for assessing quality of housing, which has implications for standards regarding quality of housing as well as how value of housing property is measured. As such, the purpose EPCs is supposed to serve in everyday life of Users and value they present them with is *very different* to the purpose and value it represents to the Experts and representatives of institutions involved in the development, implementation, and enforcement of EPC schemes.

The following report looks at the existing state of EPC schemes across the EU and aims to represent a variety of attitudes**,** opinions, suggestions, and ideas shared by participants in the U-CERT ethnographic research. Recorded viewpoints are often clearly contrasting or plainly contradictory, which indicates how science and technology, the context with which EPCs is most often associated with, are strongly interweaved with the social and cultural realms of everyday life. In the U-CERT deliverable D5.3 we managed to show how the variety of opinions about, attitudes towards, and contrasting experiences with EPC schemes are not confined to neither stakeholder nor any kind of interest groups, which we segmented in EPC Expert and EPC User profiles. In fact, variation of opinions between representatives of the same profiles proved to be surprisingly big. In this report (D2.3), we tend to focus on finding common threads across the scope of EPC profiles and stakeholder groups in search of expectations, needs and suggestions for improved design or improved user-centred contents for future EPCs. In the context of creating the next generation of EPCs, this catalogue provides ground for development of EPC products and services that enjoy widespread support, have the capacity provide reliable user-centred information of the highest quality, correspond to the widest scope of user needs (account for different building types, user types, and purpose of use), and enable optimal cost-effective performance of individual national EPC schemes.

D2.3 format and structure

U-CERT D2.3 report is built around five core chapters with two additional introductory chapters. With the exception of the first chapter, which is structured around the results from D5.3, all core chapters in this report provide a short general introduction at the beginning of the chapter, highlighting both strengths and weaknesses of the existing EPCs as well as suggesting future developments and improvements. These were either suggested by our research participants or deducted by contributors to

this report through the research and analysis process. The general conclusions are followed and contextualized with illustrative commentary drawing on the gathered ethnographic research materials. The purpose of the commentary is both to contextualize and illustrate the general outcomes as well as to point out conflicting arguments, attitudes and beliefs encountered in the research. The latter is important as it substantiates the point, that all developments and solutions developed in and beyond U-CERT should be tailored to specific contexts of the application.

> For clarity of reporting, conclusions and statements taken directly from U-CERT partner contributors' reports are typically graphically separated from the commentary to provide illustrative background to analytical conclusions made by the authors of this report. To differentiate direct quotations of our research participants from conclusions made by research contributors, "quotation marks" and *italic* font is used. To indicate the specific case study to which the illustration relates to, the standardized abbreviations of the countries are used (e.g. **BG** for Bulgaria, **ES** for Spain etc.).

The two introductory chapters – ***Executive summary*** and ***Introduction*** – summarize the content and structure of the report, explain the research and analysis process, draw relations with related U-CERT tasks and deliverables (particularly with D5.3) and provide guidance on use and application of the reported results. Introduction also provides an outline of the concept of "EPC user" and functions as concluding commentary by highlighting key takeaways and setting directions for further research actions.

The **five core chapters** correspond to the main topics of the research, which relate closely to the key aims of the U-CERT project. The first chapter, ***Characterizing EPCs***, highlights some key aspects of past and present state of EPC schemes in the U-CERT partner countries, including challenges in transition of EPC theory into practice and future prospects and necessary steps for improvement in this area. The chapter expands on the core outcomes of D5.3 by providing illustrations and indicating aspects that proved to be of significant importance through the analysis process for D2.3.

The chapter ***User-friendliness*** focuses on the core interest of the report and arguably of U-CERT project at large – designing user-centred EPCs. The chapter provides design-focused lists of strengths and weaknesses of existing EPCs, as well as development prospects for the future EPCs. Commentary highlights areas, such as EPC content, design and services.

The third chapter, ***Quality***, focuses on some aspects of quality of EPC schemes, most significantly on the quality of the existing EPC method, the quality of certification services (with focus on the work of EPC issuers), and the quality control. Although some references to technical and methodological aspects are pointed out, perhaps most significantly with regard to prospect for integration with Smart Readiness Indicator, the main focus of the chapter – as with other chapters of this report – is on how to make EPC products and services more user-centred. In this respect, the chapter ***Cost-effectiveness*** focuses on user-centred aspects of cost-benefit balance, finances, market and business context, and value of EPCs as such.. The chapter ***Wide base support*** adds on this point by focusing on aspects of purpose and meaningfulness through the lens of popular perception of EPCs as an "administrative necessity". The chapter also highlights aspects of promotion, marketing, awareness, education and knowledge. Finally, the fifth and final chapter focuses primarily on the question of ***Comparability of EPCs*** on the both local (including regional and national) as well as the EU levels.

Comparison of tasks 2.3 and 5.3

The aim of the task 2.3 and this report is to analyse perceptions on EPC scheme in U-CERT partner countries and highlight other relevant insights. D2.3 focuses on **key user-centred aspects of EPCs** combining inputs (D2.3 analysis scheme) and suggestions from the entire scope of stakeholder group engaged in the research. In contrast, the deliverable 5.3 - Catalogue of EPC experts and EPC users - builds on the same set of qualitative data but using a different analytical framework (D5.3 analysis scheme) that outlines **perceptions, needs, and expectations** of the individual stakeholder profiles. The structure of the D5.3 catalogue is specifically designed to be multivocal, presenting the diverse viewpoints regarding EPCs held within individual stakeholder groups. This attempt at presenting the variety of attitudes and beliefs, which co-create the current landscape of EPC related topics, differs from the one used for D2.3. Here viewpoints are organized in topical chapters, corresponding to notions central to the U-CERT project, such as user-friendliness, quality, cost effectiveness, comparability etc. These chapters highlight exploitable potentials for development of user-centred EPCs. This approach provides gathered data more semantic structure and indicates patterns of reasoning shared by research participants, which are used to consolidate, substantiate and expand the general conclusions from D5.3.

Research and method

In the U-CERT ethnographic research – tasks 2.3 and 5.3 – we collected and interpreted viewpoints, opinions, and feedback from the whole spectrum of EPCs Experts and Users. Through our research we gathered expectations and needs of our informants' regarding the implementation of the new EPBD and the upgrade of the existing EPCs and certification procedures. Based on our research we also identified barriers and drivers for development of the next generation user-centred EPCs across Europe.

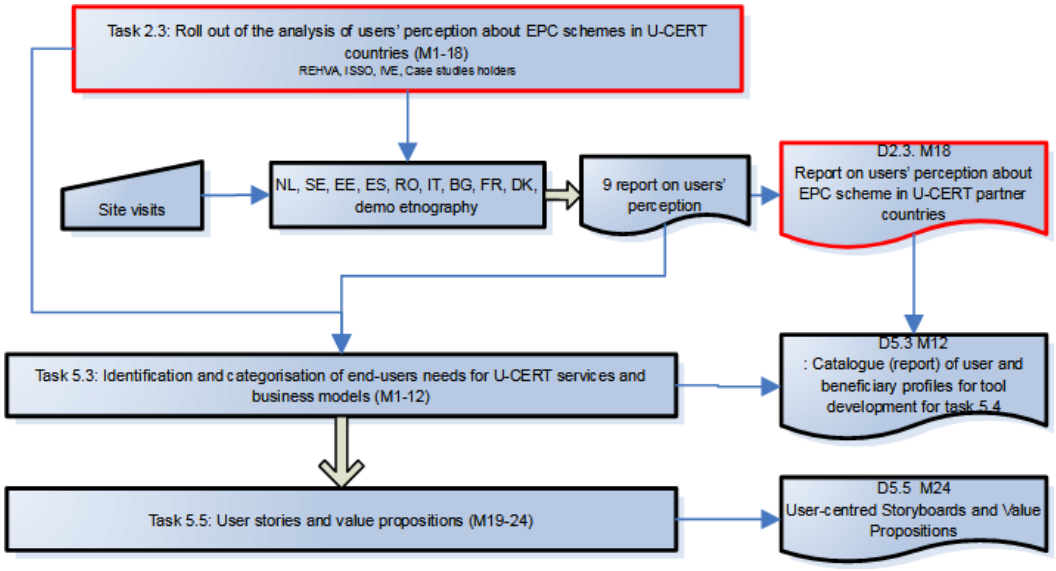

Figure 1: Scheme of relations between Tasks and Deliverables.

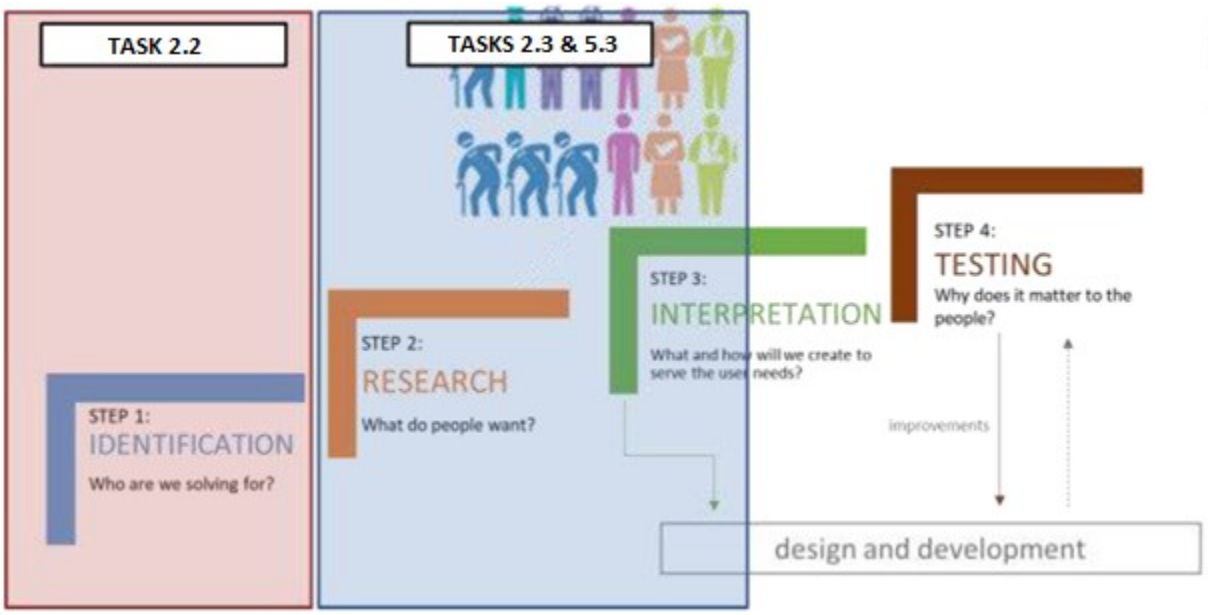

Figure 2: Tasks 2.3 and 5.3 integrated into the People-centred design & development approach.

The overarching approach of the study is based on the four steps of the People-centred development approach – identification, research, interpretation and testing. Its core idea is that understanding *people* should become an indispensable part of industrial development processes, as a means to achieve new categories of products, services, or business strategies that truly address people's needs and lead to sustainable innovation. As demonstrated in *Figure 2,* the phase of identification was done under Task 2.2. The goal of the following Tasks 2.3 and 5.3 was to research and interpret needs and expectations of key target stakeholders – potential future users of our U-CERT solutions. Task 5.4 is the following step, moving from interpretation towards design, development, and testing.

The research methods

For the both tasks 2.3 and 5.3 we practiced three primary methods commonly used in ethnographic research – interviews, focus groups and participant observation. Most frequently used were **semi-structured interviews**. These can be described as conversations with informants – usually 30 to 90 minutes in length – following a set of key topics (structure) while allowing plenty of room for open discussion depending on the informant's background knowledge and interests. Second most common method were **focus groups** or moderated group discussions. They typically follow a sequence of group activities designed to encourage active participation and exchange of opinions. The researcher facilitates the discussion and makes sure that all the necessary topics are covered adequately. Finally, whenever possible, we used the method of **participant observation**. This is a method that requires researchers to visit the field and engage with their informants and research subjects in the context of real-life environment and situations. To present gathered information, contributors used a standardized analytical format resembling a simplified version of this catalogue. The tailored methodological and analytical framework were developed and distributed to the contributors as *Guidelines to investigate users' perception about EPC scheme* (D2.2) by anthropologists of IRI UL on the basis of their pilot research conducted in Slovenia. The U-CERT tailored ethnographic method was presented to the contributing project partners on the 2nd U-CERT Consortium Meeting in the beginning of April 2020.

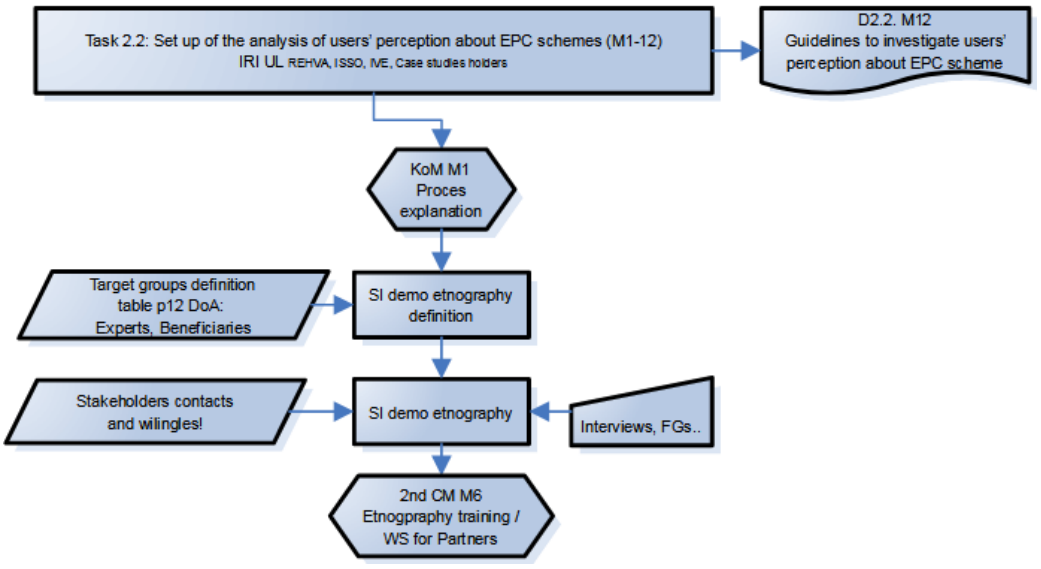

Figure 3: Ethnography guidelines development and dissemination scheme.

Impact of COVID-19 pandemic

Due to the COVID-19 pandemic the ethnographic research activities were heavily influenced. Research procedures and methods from the guidelines had to be adapted to the possibilities and capacities of individual U-CERT partner institutions. Most of the research activities have been conducted after the 2nd Consortium Meeting, between April and July 2020, in the midst of the pandemics. A major exception to this is the pilot research conducted in Slovenia form September to December 2019 by IRI UL, which was also the basis for the methodology guidelines. The rest of the research was conducted with consideration of COVID-19 related restrictions and health precautions required. To minimize possibility of virus transmission, vast majority of the research was done remotely, using either video or telephone calls and conferences to conduct interviews and focus groups. **Planned research activities unfortunately coincided with the height of the first wave of COVID-19 pandemic in the EU** (the end of April and throughout May), which resulted in delays. As the unprecedented disruption caused by the pandemic influenced all spheres of everyday life across the EU, several of our researchers faced difficulties in (re)establishing contacts with informants and conducting research activities during and after pandemic. These were additionally complicated by the fact, that pandemic was followed by the period of summer holidays. For these reasons, some partners had major difficulties with meeting the set research targets. Nonetheless, **delays were successfully compensated with appropriate mitigation actions and** we managed to gather a substantial body of quality quantitative data in the originally determined timeframe. Despite the difficulties our report delivers all of the information promoted in the U-CERT project proposal and – most importantly – presents readers with insights valuable in the context of further U-CERT developments and beyond.

	Informants and participants Total No. (No. of Experts/Users)		**Semi structured interviews**	**Focus groups**
BG	18	(6/12)	11	1
DK	29	(6/23)	10	2
EE	8	(8/0)	/	1
ES	16	(7/9)	12	1
FR	10	(6/4)	3	1
HU	16	(7/9)	11	1
IT	14	(7/7)	14	/
NL	10	(7/3)	9	/
RO	25	(20/5)	5	2
SI	29	(6/23)	10	2
SE	16	(8/8)	16	/
Total	**191**	(88/103)	**101**	**11**

Table 1: Numbers of informants involved in T2.3 and T5.3 by country and in total.

Contributions by country

This report is an aggregate of **eleven individual case reports** from across the EU – Bulgaria (BG), Estonia (EE), Spain (ES), France (FR), Hungary (HU), Italy (IT), The Netherlands (NL), Romania (RO), Slovenia (SI), and Sweden (SE). All researchers used the same analytical framework (a dedicated annex to D2.2) following the methods described in the guidelines for U-CERT ethnographic research (D2.2). In total, 101 semi-structured interviews and 11 focus groups have been conducted involving 191 informants and focus group participants, 88 of which can be categorized as EPC Experts and 103 as EPC users. More details on EPC schemes from individual case studies can be found in the chapter *EU comparability*.

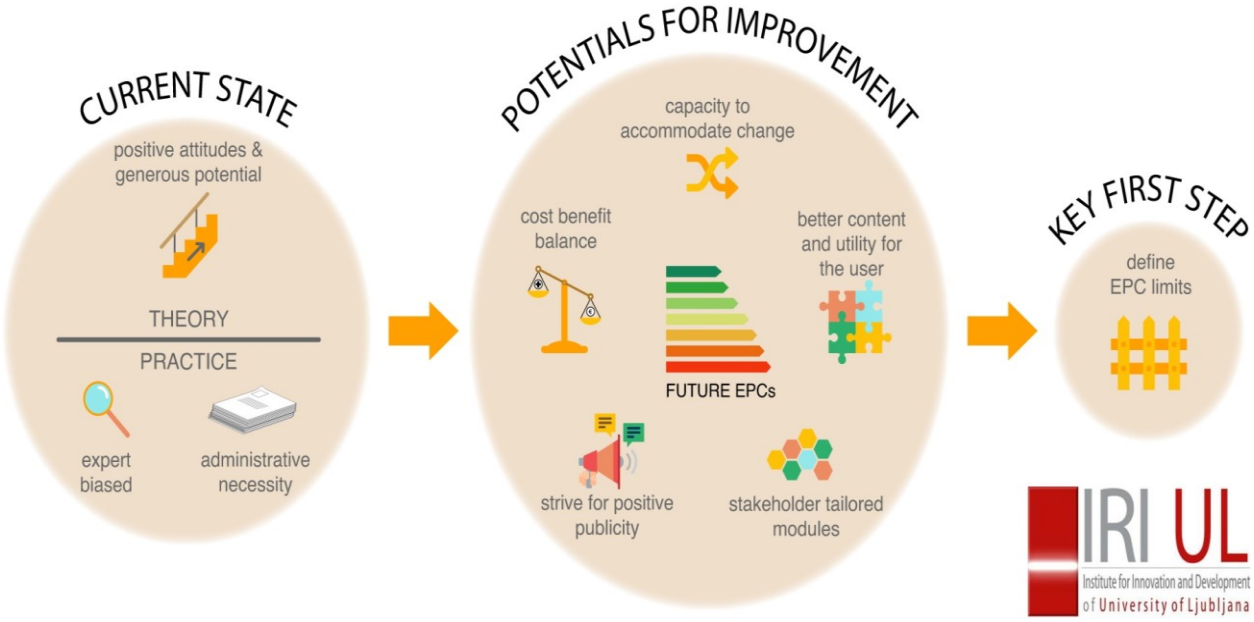

Figure 4: Visualization of results from 5.3.

Experts and Users

Generally speaking, D2.3 is focused on outlining pathways towards a user-centred EPC scheme of the future. Yet the key point remains unclear - who is "the user"? As we point out in D5.3, in the broadest sense of the term, **any of the stakeholder groups outlined in D5.3 can be interpreted as *users* of EPCs and certification services**, no matter if they are labelled an EPC Expert or EPC User. Division between Experts and Users in D5.3 is a reference point that helps us better understand the differences and similarities of information shared by representatives of stakeholder profiles featuring in the report. These include their experiences, beliefs, opinions, and attitudes regarding the existing and future EPCs, the certification scheme, and policy's purpose at large.

With regard to user experience of existing EPCs, this **distinction between Experts and Users** is not altogether obsolete. **Expert profiles** are the ones who develop, enable and enforce the EPC scheme with its underlying structures (networks of responsible institutions and their means necessary for the realisation of the scheme) and systems (combinations of structures with the specific methods, standardized procedures, laws etc. that characterize individual national EPC schemes). In terms of *use,* or perhaps *purposeful use* of EPCs, which we understand as exploiting it as means to pursue one's own interests and/or benefits, indeed **anyone can be interpreted as a User.** For the Experts, EPCs and the certification scheme have a different function, especially in the context of their work. They *use* them in a

particular way and to pursue their particular purpose. The following statement illustrates this idea of the changing function of EPCs.

> **ES** *"For the general public, an EPC is an informative document for the owner of a building, proving information about demand and consumption. It uses a coloured scale, streetlight-like, for better communication. For the general public, the EPC serves to know the current state of a building and help decide further energy renovation actions. For the public administration, it is a tool in the public policy development."* (public authority representative)

In contrast to the general public, Experts **have a deep understanding of the certification processes from the systemic point of view**. For them, an individual EPC and the act of its issuing – the individual instance of certification – is less important and less meaningful than what lies beyond them – an intertwined network of systems, policies, and structures. Or different yet, they are more concerned with the quantity of EPCs that feeds into the system rather than specific user-centred qualities of the individual EPCs.

The **Users**, on the other hand, are focused more on the concrete individual EPCs. They **primarily think of EPCs in a very pragmatic manner**, as to how they affect their everyday lives and work, and how they affect the world they know and care about. However, even if we understand **"use of EPCs"** as plainly as the individual's point of view and his **experience of the certification scheme as a combination of a service** (the certification process from the beginning to the end) and **a product** (the EPC), Experts can be understood as the knowledgeable (advanced or expert) Users. In contrast to the unknowledgeable or less knowledgeable (basic or general) Users, Experts tend to understand EPCs and make sense of the existing EPCs better, which, in terms of everyday use, makes EPCs more useful and meaningful for them also beyond the context of their profession.

Distinction between Experts and Users is therefore primarily a reference to the viewpoint and function that EPCs have for an individual in any given situation. As pointed out in D5.3, essentializing research participants to fit the categories of individual EPC profiles **is an analytical tool**. It proves useful for making out the structures behind and relations between the systemic (macro-level) and localized (micro-level) viewpoints. In other words, such distinction **helps us reflect on the complexity of EPC schemes,** related policies, and the particular ways they play out in practice – observations which are obscured from the average observer's eye and mind by the convolution and sometimes banality of what we call "everyday life". In practice, however, such an essentialist perspective rarely proves useful. The fact is that **most of our research participants simultaneously fall in several of the EPC profile categories**.

This report does not make an attempt at making a distinction between the use of EPCs for the "knowledgeable" and "unknowledgeable" Users. It is focused on exploring the possibilities in its broadest sense. Even Experts, who are many, are once likely to build, buy, sell or renovate their property, and become Users. Similarly, Users who are not Experts can also have relevant knowledge-background or a strong personal interest in the topic and would appreciate a diverse informative design of EPCs that will cover a wide range of people's knowledge and interests. Understanding and acknowledging the essentially different viewpoints shared by representatives of Expert and User profiles, as we highlighted them in in D5.3, helps us understand why informants featured in our research sometimes had radically different opinions and attitudes towards the existing EPC schemes and EPCs as

such. In other words, it helps us understand the **voids** that emerge **between** the **expert's viewpoint** on the one hand, accounting for knowledge and vision concerning the systemic purpose of EPCs, **and user's viewpoint** on the other, accounting for how people without such knowledge (or interest) experience, interpret and evaluate EPCs. In D2.3 we now shift our focus on a wide range of practical aspects related with the EPC schemes to outline possibilities for future development of the EPC concept that will serve the widest possible range of use, disregarding the individual's level of knowledge.

Conclusion and application of results

The associative field of EPCs is obviously very broad. Participants from across the EU have provided very mixed answers with regard to how they perceive EPCs. A general overview of past and present perceptions (and impacts) of EPC schemes helps us understand of the existing state and provides ground for future development of the concept.

In the light of this realization, we can conclude that if we are to pursue goals promoted by U-CERT project, **neither the systemic nor pragmatic aspects should be neglected or overlooked**. Development of the future EPCs should be approached simultaneously and consciously from both perspectives. If we are to secure the desired widespread (public) support and improve their positive impact, EPC schemes and EPCs must be understood and developed as a **conglomerate of products and services** that serve in the best interest of everyone in the value chain and **work hand in hand with other building digitalization related initiatives**. Within the established complex system involving a multitude of institutions and expert stakeholders on both national and EU levels, **future EPCs should continue to be developed in line with their most fundamental purpose, which is paving pathways towards sustainable buildings in the EU.** This should be done by promoting widespread renovation of the existing housing stock and by cementing strict policies and criteria on the level of individual member states, demanding good quality construction and energy-efficient performance (actual i.e. measured and operational) of all new and existing builds. On the other hand, EPCs should deliver on their declared purpose to provide meaningful value to their users, which includes both user-friendly design of EPC products and services as well as improving their contents and utilities.

By now it should be clear already that the goal of D2.3 is to make future EPCs user-centred for the "unknowledgeable" or the "knowledgeable" but for everyone. D2.3 **aims to provide** developers of U-CERT solutions with **insight to develop meaningful people-centred solutions, accounting for both expert and user expectations and needs** (see D5.3). It encompasses many of the potential aspects of potential future development of energy certification, that would create value related with practical use in everyday life and not only for the purpose of the certification scheme as such.

The implications and the possible use of information gathered through our ethnographic research goes **beyond U-CERT project**. D2.3, much the same as D5.3, highlights key topical strands while maintaining the multivocal quality of our informants' expectations and needs. It present readers with all the complexity of information shared by our informants, which can be used for further analysis, interpretation of explicit and implicit potentials for further research, development, and application in the area of EPC products and services and related fields.

3. CHARACTERIZING EPCs

EPCs today

EPCs have been an important part of construction sector across the EU for more than 10 years. They are expected to remain a major part of the supported programmes aimed at enabling promoting housing renovation. U-CERT project is designed to improve the certification concept in its entirety, including its technical quality as well as user value and impact. To do this effectively, we have to understand the impact of existing EPCs both in theory (policy) and practice (everyday work and life). For this reason, we asked our research participants to define or characterize their understanding of what EPCs are and how do they see them in the broad contexts of construction sector within the national contexts of U-CERT case studies.

In U-CERT report D5.3 we showed that there are significant differences in how individuals see and understand EPC schemes. Attitudes, opinions, beliefs with regard to EPCs range from negative to positive, practical to theoretical, general (broad and contextual) to extremely technical (specific). Representatives of different stakeholder groups and – importantly! – even representatives within the same stakeholder groups characterized EPCs with significant variety, depending on associations, preconceptions, expectations, and meanings they correlate with the concept. In D2.3 we try to define some of the patterns of how EPCs are defined (theory) and experienced (practice) across the scope of actors within this field to portray the complex and varied conceptual landscape of the existing EPC schemes in the EU. Building on the outcomes from D5.3, following are some illustrative examples of the recorded perceptions in a form of different definitions and characterisations of EPCs shared by our informants.

The theory - Positive attitudes and generous potential

As a theoretical concept, EPC schemes across the EU remain being seen as **positive** and having considerable **potential** for impact on Energy performance of buildings. This is best reflected in comments of the existing EPC schemes shared by U-CERT research participants that highlight the positive aspects and effects of EPCs.

BG EPCs **promote and stimulate renovation** of buildings.

EE Current implementation of EPCs in Estonia is well-suited for expert use and serves as a **valuable tool for communicating** relevant information and data about the building in a concise manner. However, there are some concerns that general end-users may misinterpret its results due to the calculation procedure being complex.

ES Document that **certifies the Energy Efficiency characteristics** of a specific property **to improve the life quality of its occupants** and classifying the building stock energy characteristics. (EPC user)

FR EPC is **a beneficial document** for both experts and users, one they can use to discuss about housing.

HU *"In my experience, in the case of two flats in which I had previously lived, the energy performance certificates well reflected the energy characteristics of the flats."* (EPC user)

NL The new Energy performance certificate (according to NTA 8800) **has a big potential** in future when it is used for more accurate energy predictions connected to smart metering and sensing, including user behaviour, regional and social aspects etc. But this still must be developed.

A predominant manner of describing EPCs has been to highlight their **technical and utility aspects**. Here are some illustrative examples reported by the U-CERT research contributors.

BG EPCs identify and evaluate the current energy performance of the buildings across the country. (public authority rep.)

A document representing the energy use of a building. (building owner)

EPCs define energy savings measures. (public authority rep. & EPC issuer)

A document presenting the retrofitting measures and the associated costs. (building designer)

EPCs provide information about the condition of the building. (public authority rep.)

EPCs provide an information about the condition of the building regarding the energy efficiency levels. (building manager)

HU Summarizes and quantifies the energy efficiency of a residential building, how economical the given building in terms of energy consumption. (EPC user)

"Calculation and estimation of the annual energy consumption of the building. In case of new buildings, the EPC is a prerequisite for applying the permit of usage." (EPC user)

"The EPC presents the annual energy use of a building, which has heating system. Its purpose is to label the building taking into account its energy use, and to propose investments, that reduces the energy use, if the building got energy class less than category C." (EPC user)

The EPC is a document made by independent expert, which expresses the energy performance of the building and its heating, cooling, domestic hot water and ventilation system, as well as lighting system in non-residential buildings. The EPC provides renovation measures. (EPC issuer)

DK Energy performance certificates (EPCs) are a rating scheme to summarise the energy efficiency of buildings in Denmark. The building is given a rating between A - G, the EPC will also include tips the most cost-effective ways to improve your homes energy rating.

ES The EPC is a way of stating the level of energy efficiency of a building or building unit with standardized criteria. The EPC serves to compare buildings, to inform the final user towards having more transparency in the decision-making. (EPC issuer)

It is a technical document addressed to the final user with reliable information about the energy efficiency of a given building. Its purpose is to inform, by means of meaningful and understandable elements, about the energy performance of a building. It fulfils a similar task as the technical catalogue of an appliance, there is the energy

label, but also there is some more detailed information about the performance. (public administration rep.)

IT It's a certificate of energy performance that explain building performance through a numerical indicator in kWh/ m² of primary energy and a quality classification (explained in letters A, B, C etc.) that is the energy class.

SE The EPC issuing process relies on measured data (24 consecutive months) for existing buildings and simulated data for new buildings covering only primary energy use. It has had already a positive impact on building technology decision-making via the primary energy weighting factors even if for now very moderate. It doesn't yet take into account the environmental performance of buildings (CO_2 emissions) which would further nudge the decision-making. (Real estate developer)

Another common way was to define EPCs was contextually – in correlation or with reference to related concepts, EU regulations, and administrative requirements.

BG Different "names" associated after showing or explaining what is the document in question: **"Energy passport", "Summary of the energy audit", "Building passport".** (various)

BG **Result from the energy audit**. Designers take it into serious account in their work on the renovation projects. (building designer)

BG *"The goal of the certificates is to show if a building is energy efficient and if it allows for better living conditions compared to another building."* (building occupant)

ES The reality is that this document has been designed **to ease administration procedures** related to energy efficiency and is not useful to extract any accurate conclusion of the studied property.

ES A document which classifies and **standardizes the EE in properties**. (EPC user)

IT It's a building energy performance whose purpose is to improve the quality of current certification in all of the EU.

NL Policy officer explains that in his perception there are 3 main goals of the EPC: 1) bring new buildings to a certain level, 2) awareness and 3) helping users and owners to make the right renovation decisions.

SE In Sweden, the public trust the EPCs "too much". People think it is exact when in fact it is not. As the Swedish contributors explain, EPCs do not reflect 100% real performance it is just measured or simulated + normalization calculation. There is a calculation method based on a standard, which is periodically updated for making the whole process quality assured.

Practice – expert bias

In comparison with the declared purpose of EPC schemes it certainly seems that **potential of EPC schemes has not yet been fully realized.** This is already reflected in some of the examples above, indicating that EPCs are often either not clearly understood conceptually or that they are not clearly defined in the first place. The following comments further illustrate the shortcomings or even critique the existing schemes and their design. They also highlight a **strong expert bias of the existing EPC schemes,** both in terms of design and content of the EPC as well as the benefits and values that they create by and large. For users with little relevant knowledge background and without strong intention (and capacity) to invest in construction or renovation of buildings, the existing EPCs present **poor value** and are often described as being **difficult to understand** or even "useless".

BG *"In most cases, how should I say, the EPCs are safely kept in the drawers, and the consumptions after the measures is not compared to what is prescribed, if the parameters are maintained… at practical level, it all stays on paper."* (building auditor, EPC issuer)

A few of the experts define the EPC as hard to understand for non-specialists.

DK Current Report is experienced as long and unmanageable. It's difficult for normal building owners and users to fully understand the conclusions of the EPC, which doesn´t offer a real link to the current conditions of the property and how to improve the energy performance.

ES The full potential of EPCs as they were first conceived has never been exploited.

HU The original purposes of EPC are only partially fulfilled. The labelling itself and expressing whether the building is good from energy point of view, would be a good way to inform people about the energy performance of buildings. However, the importance of the EPC, the rating of the energy use of buildings has not been spread yet in the society.

SE For laypersons even the label (energy classes) is not always completely understood and when it comes to primary energy indicator things become even more difficult. Furthermore, they don't benchmark or compare with other buildings and as result they don't really take the EPC into account (even if Swedes are aware about energy and environment issues). The above needs to be improved and additionally people would like to see the potential measures they can take and what benefits this would bring. For now, people rather give attention to the building services than EPC when renting or buying. (Real estate developer)The vast majority of research participants agreed that EPCs should be better promoted and brought closer to people to realise their "potential". Some, however, believe no major changes to existing EPCs are needed to achieve this. For example, several claimed that typical colour-scales in the existing EPCs are enough for an average user to understand the point, and that they do not need anything else. This implies that **no major changes are needed in terms of making EPC products and services more user friendly,** much in the direction of EPCs are to be

considered strictly as a document presenting raw data on building's energy performance parameters**.**

BG Some experts either do not expect any changes or believe the EPCs are good enough and the reasons for the limited market demand is not related to their format.

SI *"But tell me, how often do you look at your ID card? Except when someone requires you to. This* [EPC] *is really just an ID or doctor's certificate for a building. You look at it when you have to, one that has to, not others."* (EPC issuer)

Despite such opinions, and recognising their legitimacy, we continue to focus on possibilities for making EPCs more user-centred and useful. The Danish contributors suggested to focus on the following three aspects for improvement:

- Increase use for energy efficiency action (not only as a reference point for real-estate trade)
- Streamline and support the realisation of energy efficiency actions
- Improve economic justifiability of energy efficiency actions

EPCs as administrative necessity

Implications of the expert-bias are complex and correspond to individual national and regional contexts. We characterized them in further detail later in this report as well as in D5.3, where we focused specifically on individual expert profiles. From the user's perspective, which is the main focus of D2.3, two of the most widely reported and arguably most problematic perceptions are that **people are either largely unaware of the existence and purpose of EPCs** or that **they are simply perceived as an "administrative necessity".** This is best illustrated with the following comments shared by research participants from both expert and non-expert communities.

BG Most representatives of general users in Bulgaria had no immediate association with the notion of "Energy Performance Certificate".

"Never seen it." (building user)

"The energy certificate is required for issuing a building permit, it specifies the project energy characteristics of the building. For old buildings – I do not know what benefits it could have." (building designer)

Required to receive **building permission**. (EPC issuer)

The EPC end-users are often described as unaware of their obligations regarding EPCs, the principal benefits of the energy auditing, benefits of energy efficiency, etc.

EE Added value of EPCs has not yet been fully realized in the market, EPCs are still seen as a "must-do" activity rather than an opportunity to improve the asset.

NL An EPC-scheme can be interesting when it relates to real energy use. It becomes then a driver for improvement for building users. Only showing a label not related to real performance and user behaviour remains a bureaucratic toy.

SE Voluntary environmental assessment and certification (e.g. green buildings) is more important than EPCs. (Real estate developer)

This opinion, largely shared by and grounded in experience of both expert and non-experts alike, reveals **a passive character of the existing EPC schemes.** Research outcomes indicate that the existing EPCs are seen as little more than part of necessary paperwork on the path towards an end-goal, which at present includes either selling, buying, or renting a house/building. Although intuitively one might expect them to also be used in close association with renovation, which is also one of the U-CERT goals for development of EPCs, existing EPCs are rarely used in this context, especially by individual homeowners. Consequentially, the practical (experienced) value – meaning that EPCs should be a valuable and meaningful product and service – and impact of existing EPC schemes among the general population is limited. The existing EPC schemes seem to primarily serve the administrative systems and structures of established knowledge and expertise that help(ed) establishing and maintaining it.

Some experts even voiced a belief, that the purpose of EPC schemes is not primarily to serve the general population but for EU member states to fulfil their obligations to the EU.

BG EPCs support the **implementation of EU policies**. (EPC issuer)

SI Its purpose, in theory, is to decrease energy use. In practice, to fulfil obligations to Brussels. (EPC issuer)

SE EPCs are well accepted, taken seriously and important, however they are not part of building performance management processes. EPCs rest on the side as legal obligation. (Public real estate)

Future vision(s)

Despite the plentiful and often well-founded criticism, the EPCs are here to stay, and most importantly, not only as a theoretical idea. They have been established and integrated in the landscape of construction sector across the EU and they will either persevere and continue to function as they are, or they will evolve to realize the potential and meet at least some of the expectations mentioned in this report.

Cost-benefit balance

While many research participants across the EU have outlined a rather negative future for EPCs, others have expressed more optimism.

BG *"There are undoubtedly technical grounds to improve the EPC; but there is no economic stimulus because the EPC only relieves taxes on buildings built before 2005, and it is very small. There are no other stimuli."* (energy auditor)

"For the last 5 years, there is no development and there is no initiative to development. There is no active institution that is engage with changes in the EPC." (building auditor, EPC issuer)

DK More and more building owners and users will realize the importance of building energy efficiency and indoor environment quality in the near future.

ES There is a need for EPCs to be more transparent and accessible to final users, not only technicians. It is a very abstract piece of document and doesn´t put emphasis on those facts that really encourage users to have it in mind.

As time goes on, the impact of EPC will be greater. When many existing buildings have undergone energy retrofit, and similar buildings have different EPCs, the impact of its label in the decision-making will increase.

The EPC should be a living document aiming to ease the decision-making process towards energy renovation actions. It should be periodically updated and tied to wellbeing of users.

SI *"We should focus, first and foremost, on aspects of energy needs and use. Everything else is secondary."* (EPC issuer)

The **cost-benefit balance** of EPC products and services presents itself as a critical point in the effective realization of the EPC scheme. On the one hand, **low price of EPC products and services undervalues the work of EPC issuers** and undermines the overall capacity of the system to deliver quality results. On the other hand, **user's perception of value is largely dependent on the benefits and qualities of the products and services they consume**. In this regard, the existing EPCs seem to be caught in a "vicious circle", being simultaneously undervalued, which affects the quality of the end product (the EPCs), as well as offering **poor value to the users**, which makes EPC schemes largely unpopular.

Finances tend to dominate the discourse about the attractiveness of EPCs and attitudes towards them, both on the side of EPC issuers as well as EPC customers.

BG *"The private investors are much more awake because they feel it through their pockets. The public buildings… they don't really care. But I think for the private investors, the most relevant parameter is money. That's the argument that could spur them to do whatever it takes. And if they have an easy interface through which they could see where their bills stay compared to similar units, then they would go and check the certificate about these separate parameters which need to be improved to cut the bill – doors, windows, roof, etc. But not vice versa – the first should be the money."* (building designers - architects)

In this regard, opinions have been voiced that **that the future of EPCs is dependent on "the market"** as a driver for the development of the concept. Currently, however, there is a general lack of **market-based solutions for acceptance of EPCs across the EU.**

This should develop in a way that it promotes a more complex energy consultancy services that will become attractive for investors. For this, however, the market has to be developed, which requires a certain level of stability and systematic (publicly funded) support. As reported from several case studies, the inconsistent policies and partial support presents a challenge for market development and hence for the future of the EPC schemes.

ES The EPC could be more ambitious. If it aims to serve as an energy diagnosis for several years, that potential should be used, avoiding becoming a "dead document". There is still potential. The user acceptance will increase with time. As renewable energies and energy efficiency become more popular, the awareness of the role of EPCs will also increase.

SE For new buildings the EPC is prepared based on simulated data for 24 consecutive months, however after 24 consecutive months of operation, no follow-up and no compliance are required for checking the gap between simulated and measured performance. The EPCs should create a building performance framework in which follow-up and compliance checking is mandatory (add punishment) and goes at least from monthly to hourly time step. Although it would entail slightly higher costs this would ensure actual results on the ground and moreover incentivise all building sector stakeholders to close the simulated-measured performance gap making the whole process much more cost-effective and reliable. Big players already work with contracts that impose simulated-measured compliance and entail punishments if not met in practice because the market asks for it. (Real estate developer)

Research indicates that most people responsible for implementation of EPCs recognize the shortcomings of existing EPCs.

BG *"In all meetings with colleagues from all other countries, we discuss one and the same topic – what are the ways to reach the households. What are the ways to make the EPC more attractive, more recognizable in general. It is very important to find the balance – the balance between the technical details, which have to be correct because we use that to report on the national goals, and this is monitored by the EC, but on the other side to make it understandable. When it is understandable, it will become popular. This is hard, it's really hard."* (public authority representative)

To enhance the impact of the EPCs on Energy performance of buildings, the **certification schemes should evolve to communicate efficiently key aspects of human-building interaction in relation to energy performance**.

NL The manufacturer says that the aim of the EPC is that in the end buildings will become energy neutral. However also the user aspect is of importance: it is important that people can live nicely in their homes without comfort problems. It should be about the people living in those houses and about living in a healthy house.

SE The current focus on energy only and only the energy used by a selection of building services doesn't provide enough evidence to support decision-making and link with the behaviour of people. The scope should be extended to carbon emissions and IEQ and cover all energy uses in a building (e.g. also equipment plugged to sockets) influenced by the behaviour of people directly or via automation. (Real estate developer)

Future EPCs have to provide **better content and utilities** to the users – including indicators of IEQ, meaningful financial indicators, meaningful improvement measures and renovation guidelines, easy access to expert services etc. – as well as the design of both the product (the EPCs) and services (the certification process) to make them more interactive, people-friendly, and comprehensive. In order to create favorable market conditions, developers and implementers of future EPCs should also strive for **positive publicity** and invest in strategies to raise general awareness about Energy performance of buildings and the specific role of EPCs in this context. This includes aspects of knowledge transfer, educational contents, promotion and marketing, all affecting the general public attitudes and opinions regarding the EPC products and services and the underlying policies.

Digitalization and other technical aspects

There is **a significant associative correlation between EPCs and the all-encompassing digitalization trends**. Several U-CERT contributors pointed out that digitalization should be at the centre of energy efficiency efforts in the future. Our research participants also pointed the possibility of monitoring their energy use (average levels, current use, statistical comparisons with relevant/comparable cases, etc.) as particularly interesting. Several informants expressed expectation that EPCs would evolve both in direction to function in a digital environment and with the potential to integrate information about the new "intelligent" features of the building (SRI).

BG *"It is obvious that lots of efforts are invested in the development and introduction of smart readiness building indicators, although this scheme is not obligatory but voluntary. This is related to the digitization and it is clear that the societies are moving in this direction, is it is unavoidable for us as well."* (public authority representative)

IT Some informants suggested that the user and the experts should be able to consult some web pages or some apps.

The Slovenian contributors reported a rather more conservative take on the question.

SI *"Interesting question. That it* [SRI] *would be part of EPC, I don't think so. /…/ Digitalization is always the users' issue, will they use it or not. We have different generations and at the time being we have few enthusiasts who would want to use it. /…/ So, we are only a business and we have to consider the economic effects of such developments. For us the question is – how much will it cost and what will the impact be."* (product and service supplier)

One of the main issues related to digitalization of EPCs and indeed such developments at large is one of **privacy**, or rather, **data management, protection, and security**.

SI *"It* [SRI] *is a technical indicator with capacity of complex intertwining of physical and theoretical. /.../ Such digitalization, however, is still evolving really. There are numerous unknown variables and potential issues. One of the key ones for sure is privacy."* (building expert)

Meanwhile it is important that the evolution of the concept and integration with new technologies is continuously controlled.

ES The software tools to issue EPCs should not limit the inclusion of innovative products and solutions. However, these technologies must be technically validated and have enough proof of a given performance. Otherwise, EPCs will lose reliability.

This, however, is easier said than done.

ES The problem is that the tools are not updated very often. Therefore, they are outrun by the market. New design strategies, bioclimatic elements, new technical systems are developed, and they cannot be introduced in the existing tools.

Accommodating change

The scope of interpretation of the purpose of EPC products and services is very wide. With evolving policies, technologies, and knowledge in the construction and buildings sector, **capacity to accommodate change** is becoming an increasingly important quality. This involves both integration of existing technologies with new and developing ones on the one hand, and the necessary organizational (policy) structures on the other. Especially the latter has shown to be slow when it comes to accommodating change. In this regard, several research participants expressed some sort of aversion to change, or rather, pointed out, that **major changes to existing EPCs are not desirable**.

BG There were no changes in the normative (national level regulatory) framework in the past years and there are barely any expectations for them – both from experts and users.

IT Even in Italy, and I think people all over the world, are not inclined to change because they are strongly attached to certain aspects of their life and do not like to change it.

Whether or not the change regarding future EPCs and associated policies will come easy, or at least easier than with the first EPBD, opinions are often contrasting. **Most research participants** who commented on this **expect little or no change whatsoever. They also expect little change in relation to the practice and contents of the existing EPC schemes.** Although many research participants believe there is significant technological basis for development, most significantly as some form of digitalization of EPC schemes, few see it happening any time soon, mostly due to “lack of economic stimulation”.

BG The application of the mandatory EPCs is important for the stable increase of the renovation rate, however it will be hard to implement.

While the majority are sceptical with regard to the process of implementing any meaningful change, implying it will be a long and demanding process, **some expect the process to be easier that the first iteration of implementation of EPBD related policies, including the EPC scheme.**

IT Even in Italy experts believes the new generation EPBD is going to be easier to introduce, also from the point of view of stakeholder support, given that the first generation prepared the ground for its successor. Some experts, however, disagree with this reasoning.

SI Implementation of policies without experience and sufficient or suitable knowledge base, as reported by informants for the Slovenian case, is very challenging. For Slovenia the first generation EPBD implementation was very time an effort demanding regarding both policy development and implementation. Slovenia has had limited (or no) previous experience with energy efficiency related national databases, management, or methodologies. For MS with previous similar experience (e.g. UK, Denmark), informants suggest, it must have been much easier.

SE After over 10 years since the EPCs are in place it’s good time to have a look in a holistic way (total overview) at what parts need to be improved. The good ideas from the beginning have been implemented and now also concrete experience gained. (Public authority)

Most informants also have **few expectations regarding** the future of EPCs and their overall **impact on people's lives**.

BG The Bulgarian EPCs is sufficiently detailed and there is well established practice. Potential changes would be likely be connected to smart buildings indicators and digitization and simplifying the auditing requirements for individual buildings.

Yet again, judgements with regard to the future of EPCs tend to be very diverse. With respect to the U-CERT mission, it is worth stressing **an "enthusiastic" note**.

IT Several informants believe, that the forthcoming EPBD will bring major change also because in Italy in recent years there have already been many changes. Some users say they are *enthusiastic*.

Defining the limits

In the light of continuous change in the expertise and in the market, efforts should be made to define not only **potentials for development** of the EPC concept but perhaps even more importantly to define its **limits**, especially in comparison to related concepts (BIM, Energy Audits, Inspections of building services, digital building logbook etc.). This will enable more concise definition of the EPC contents and utilities, as well as clearly define the **capacity** of the concept **to meaningfully integrate with related concepts**, such as BIM models, Building passport, digital twin etc.

NL You need to understand the limits of the tools you develop. Not all goals can be met using one and the same tool. You need a separate tool for stimulating innovations for new buildings, one for awareness raising and one for helping the renovation advice.

As indicated earlier, **EPCs are often associated with related concepts, such as Energy Audits, Building Passports, etc.**

BG While there are different perceptions, most of the professional users define the EPC as a result from an energy audit. Thus, it is expected to include the main outcomes of the audits in terms not only of energy consumption, but also concrete measures for improvements and their cost efficiency (as it does).

SI *"No, as far as EPCs are concerned. For me this is an extension of an energy audit. Now if this is like a summary of the energy audit it is enough for me."* (product and service supplier)

This indicates **a need for a clearer definition of what EPCs are, what their purpose is, and how they relate to and differ from these concepts (and products)**. This is needed to make the development of future EPCs manageable and effective.

4. USER-FRIENDLINESS

One of the underlying assumptions at the beginning of the U-CERT ethnographic research was that there is a considerable lack of user-centred value in the existing design of EPC schemes, which includes both EPCs as a product and the certification process as a service. This indeed proved to be true. The notion of *value* is rather slippery, one that is difficult to pinpoint. In this report, we attempt to look at it from different angles, represented by the core chapters, and starting with perhaps the most concrete of all – the user-friendly features of the EPC products and services.

While people do not recognize existing EPCs as useful or valuable for a variety of reasons, the idea of user-friendliness or usefulness undoubtedly plays a central role. What *is* or *is not* "user-friendly" is itself a difficult question to answer. Certainly, we can already conclude with considerable certainty that **whatever people find useless is unlikely to have any significant impact on their life**. And impact is indeed a key notion as several research participants with expert knowledge background pointed out that **the biggest shortcoming of their existing national EPC scheme is** not the quality of the methodology nor results, but **the absence of any significant *impact*,** which we can define as tangible, measurable or describable influence on the people and the world around them.

Making future EPCs more user-friendly is one of the key goals of the U-CERT project. However, it is important to stress that focusing on a single aspect of the EPC scheme, such as user-friendliness, cannot solve all of the problems. Nonetheless, this aspect is certainly one of the more concrete and manageable steps towards making EPCs more impactful. In this chapter we will focus on rather technical aspects of usefulness that proved as key aspects of user-friendliness during the research – its content (included data and information, aspects of awareness and knowledge, contextualization and complexity), its design (visual and structural organisational) and its related services (the certification process, customer support, etc.).

This chapter focuses on **user-centred aspects** that have the potential to make EPCs **practical**, **useful**, **easy to understand** and **easy to access** – all properties that create value and make EPCs more desirable for general population not only in theory but in practice. Some notions, closely related to aspects of user-friendliness and equally important with regard to the question of value of EPCs, such as quality, balance of costs and benefits, purpose, education and promotion, comparability etc. will be mentioned and discussed in detail in the following chapters of the report.

General outcomes

Positive properties of existing EPCs

Informants pointed out several positive properties of existing EPCs:

- **Easy access via the national authority website**
- **Information raising awareness about energy use** and the energy class.
- **Visual representation** of energy class (the colour-scale, pictures, diagrams).
- **Suggested renovation measures** and recommendations for improvements of the building components and systems.
- **Cost-efficiency calculation**.
- **Possibility of comparison** between pre- and post-renovation energy use.
- It provides **data regarding the building:**
    - List of the main features of building elements.

  - An overview of the building's energy performance status.
  - Includes very specific data (summer overheating, share of Renewable Energy sources, detailed information about building envelope, systems, …).
- It provides **meta data regarding the EPC**
  - Reference regarding the EPC issuer.
  - Date of validity.

Negative properties of existing EPCs

The existing EPCs are reportedly (too) long, complex and difficult to understand. Research participants pointed out the following negative properties of the existing EPCs:

- **Lack of context and explanations.**
  - Calculations are virtually impossible to understand.
  - Categorisation in the form of energy classes is unclear. It does not provide sufficient context for realistic (relative) understanding of the building's condition and feasible options for improvement of the building's performance.
  - Measures presented in the existing EPCs are often poorly described, generalized, and individualized (stand-alone, not promoting integral deep renovation action). They also fail to address any aspect of user-behaviour.
  - Potential impacts of renovation measures are typically left undefined and are therefore unclear.
  - Existing EPCs are a static document with virtually no capacity for relevant updates or monitoring functions and therefore decoupled from actual building performance and property management processes.
- **High density of data and information**.
  - Some data and information seem to be obsolete (e.g. vapour pressure figure at building structures in HU).
  - No explanation (lack of clarity) on interrelation of different elements, individual data points, and measures presented in the EPCs.
- **Absence of particular data points** (for advanced users).
  - Percentage intervals of categories (e.g. category C from 101% to 130%) are not presented.
- **Complex terminology, parameters and units.**
  - Eg. kWh/m^{2}a.
  - The content is rather technical and needs "translation" in layperson terms (friendly, informal)
- Lack of call to action
  - Users don't get the information timely enough to make a difference
- **Poor visual representation.**
  - Unclear graphs.
  - Lack of visual guidance.
  - No interactivity.
- **Lack of expert support** (poor accessibility of EPC related services).
- **Lack of cost indicators.**
  - E.g. projected costs and benefits of measures included/suggested in the EPC.
  - Lack of information about the cost of issuing the EPCs.

Prospects for improvement

Research participants pointed out the following improvements for enhanced user-friendliness of EPCs:

- Provide **guidance on how to read, understand and use** the EPCs
  - Provide educating opportunities adaptable to individual's expectations and needs and flexible with regard to specifics of the various social contexts and scenarios in which EPCs are being used.
  - Provide EPC integrated contextual information and clarifications.
  - Enable easy access to expert support and guidance.
  - Indicate clearly (e.g. an identification number of the EPC on each page) that all pages are inseparable from the title page and how individual segments relate to each other.
- Provide **information on financial relations**, including:
  - Costs of investments.
  - Returns on investments.
  - Cost of non-investment/ opportunity costs – lock-in effects of certain choices (maintaining status quo).
  - Possibilities for subsidies, grants, tax cuts and other public funding/support options.
  - Annual energy cost (scenarios) for different energy sources and systems (natural gas, electricity, district heating, wood, pellet, ...).
  - Introducing quantitative data of building structures in a way that is set for getting a quote from product and service suppliers.
- Enable/include interactive features for **real-time building energy performance** information:
  - IEQ.
    - Power kW (not only electricity).
    - CO_2 emissions.
    - Safety.
- Enable **comparison options**, such as:
  - Average energy performance and costs for the individual building/property (per week, month, year, three-year period, …).
  - Average energy performance and costs for energy of similar buildings or dwellings.
  - Scenarios and/or examples of energy performance for different building systems.
  - Performance in comparison with a building/property the user knows personally very well.
  - Performance in comparison with legally required standards.
  - Performance in comparison with comparable buildings/properties (energy costs, building properties, building systems).
- Provide **suggestions for improving the building's energy efficiency**, which are:
  - Easy to understand (tailored to the user's knowledge and interest).
  - Tailored to the specific building/property.
  - Financially contextualized.
  - Clearly present the relation between costs, benefits, effort, and risks.
  - Comment on the existing condition of building structures and HVAC systems.
  - Meaningfully contextualize data regarding the proposed measures, e.g. number and sizes of each windows and doors. This will facilitate design and implementation of the proposed measures.
- Enhance **visual representation**:
  - Visualize causal links between user behaviour and building performance.
  - Education by visualizing energy/power and IEQ implications.
  - Use graphs and infographics.

- Use colours & segmentation of the document.
- Omit (hide) unnecessary data and information.
- Introduce gamification features (objectives, missions, etc.).

- **Provide relatable references**, such as:
  - Comparable data and information from building/property the user personally knows very well.
  - Contextualization of provided data and information (user needs to know why a particular piece of information is provided, otherwise it is better no reference is given).
  - Energy costs (the existing, past, and projected costs; an option to demonstrate potential savings depending on different scenarios of introduced measures, for different types of energy sources and technologies, …).
  - For advanced and expert users, primary and final energy indicators are a useful reference for detailed understanding of what kind and how much energy the property is using. (DK)
  - Provide meaningful correlations between data and information on building's energy efficiency on the one hand and questions of safety, health, wellbeing, and comfort on the other.
  - Drawing parallels with performance indicators (such as with cars etc.).
  - Health and wellbeing indicators (IEQ and human-building interaction indicators).

Content

General discourse regarding EPC schemes communicates that existing EPCs are interesting for an average person. This has been reflected in some comments shared by our research participants.

BG *"Even if you don't buy, don't sell, don't rent, every person would probably want to know more about the building, what living conditions are provided by the dwelling."* (building occupant)

Reality, however, is somewhat different. In fact, our research shows that **most general users tend to have difficulties understanding** and drawing meaningful conclusions from the content – data and information – provided in the existing **EPCs**.

ES All agree to overhaul the document. To measure only in kWh is not relevant for the most part of the population. To rethink the layout, making it comprehensible to everybody, linking the different sections (energy-renovation measures-investment...). It would be interesting to know the performance of the building, with each individualized installation to know where to improve.

SI *"As far as comprehensiveness* [of EPCs] *is concerned, individuals do not understand them. Even I, and I'm from the expertise, but I don't really understand them."* (a professional facility manager)

FR The vast majority of users are not familiar with the study scenarios used in the calculation methods. They need to be aware that they have to comply with them in order to obtain similar consumption. For example, "To reach this grade you have to heat your housing at 19°C", or "this scenario is for a family of 4 person".

SE The content of EPCs is rather technical and needs to be translated in layperson terms in a friendly and informal way so that users know how to react and what behavioural

changes are recommended (guidance and education). Moreover, the users don't get the information timely enough to trigger any action on their side. (Behavioural change researcher)

Exploring this aspect of existing EPC schemes provoked interesting reactions. A general tone was that **perceptions largely depend on the individual's interest, background knowledge, and engagement**, as briefly illustrated in the following statement.

BG *"I would say that it's 50:50. The people who are dealing seriously with energy efficiency think that they* [EPCs] *are not good enough, people who are not so serious are satisfied."* (experienced building certifier)

SE What drives change is different between residential and non-residential buildings. For residential the bigger picture of climate change represents a more idealistic internal motivator whereas the commercial side is more cost oriented The market is very fragmented in general which causes confusion, in which direction to go in what to invest? (Building technology manufacturer)

Experiences shared by several EPC issuers indicate that the **existing EPCs are indeed difficult to understand for general users**. We can substantiate their claims with observations from our research activities, in particular from the focus group activities. U-CERT research participants had issues understanding EPCs individually and without sufficient explanation. As illustrated by a statement from a focus group activity in Hungary:

HU None of the focus group participants knew the definition of primary energy. *"The energy performance certification mostly contains information that can only be interpreted by professionals. /…/ The existing form of the EPC is useless."* (a general user)

Several research participants, some of them high-ranking officials and experts in the field, shared **contrasting opinions** or expressed disagreement with such observations, claiming that EPCs are in fact "easy to understand".

BG *"Given the fact it is easy to understand for the citizens, it is obviously easy to understand for us as well. I think it is well shaped out – as a format, and in general."* (public authority representative)

Nonetheless, there are more indications that **people do find existing EPCs difficult to understand**. What is more, people also find it **hard to understand the long-term benefits** of EPCs. As reported by several research contributors, people do not understand concepts such as **life-cycle cost analysis.** They also have a hard time imagining **what to expect from renovation investments**, which often present a significant financial burden, which can result in a sense of "**fear of the unknown**", passiveness, apathy and ignorance. All these aspects are closely related with topics of awareness, knowledge, and education, which we discuss more in detail later in report, especially in the chapter *Wide base support*. Here we will now take a closer look at more narrow aspects of the content, such as its complexity and contextualization of data and information, before moving on to language, visual presentation, structural organisation, and services.

SE EPCs don't really illustrate what is a good performing building and neither the multiple benefits stemming from that. One needs to be interested and dig further. On top EPCs should go towards close to real-time measuring of performance as mean to make EPCs a more significant tool for property management processes. For the time being EPCs are a side activity which is nonetheless recognized as important still perceived as obligation and not integrated in day-to-day building related activities. (Public real estate)

Contextualization

Comprehensiveness or **the level of understanding of the data and information** provided by the EPCs clearly depends on the individual. People with significant background knowledge will make meaningful conclusions faster. Research indicates, however, that **general population does not have such capacity** and therefore finds existing EPCs largely incomprehensive.

DK The report is too complicated to understand, which has a negative effect on people's active acceptance of EPCs.

SI *"They* [EPCs] *should be such that anyone can understand it really. That people might start acting earlier if they would know, that their engagement means X result. But if you don't know, whether the difference will be 3 or 30 %, probably half of them do not even try."* (facility manager)

SE Users get the colours of the energy classes even if that's not enough to trigger anything. What they have a really hard time understanding that 1 kWh electricity is different from 1 kWh heat expressed in primary energy. (Energy efficiency services provider)

What is more, **some of U-CERT research participants were largely unfamiliar with EPCs or even unaware of their existence.** Considering that research participants invited to take part in the research were supposed to have had some sort of experience and interaction with the EPCs (through either buying, renting, or building a property), this realisation speaks for itself.

BG Most general users involved in the Bulgarian research never tried to understand an EPC. Some pointed out seeing EPCs in public buildings.

"Generally speaking, people do not understand the EPCs as they are given to them without explanation and they do not have sufficient motivation and time to dwell on what is hidden behind these numbers." (building auditor, EPC issuer)

DK Some building owners/users do not know what EPC is. Some building users think EPC is calculated only based on annual heating bills. Only a few users can describe the definitions of EPC correctly.

As pointed out earlier, many participants found **certain technical aspects, notions, and concepts difficult understand**.

DK Here the whole issue of heat source comes in due to the multiplication factor on electricity. No one understands it when electricity increasingly comes from renewable sources. Why is the factor so high? It causes a bad perception and use of the EPC scheme.

ES Users understand the energy rating but don´t really know what it means and moreover, they don´t know how to relate its results to the energy saving measures.

ES The analytical part of the EPC is fairly well understood, although it is not well explained why the sum of emissions per square meter for each of the parts is not equal to the sum of annual emissions.

Even elements which at first seem to be simple to understand, such as visual representations and graphs, in some cases proved to be incomprehensive and confusing. Here is an illustration on the scales representing energy label/class of the building.

FR *"If the two labels have the same note it's fine but how to interpret if it's not the case? Which combination is acceptable or not acceptable?"* (EPC user)

Lack of understanding does not mean that everyone has to be experts to come to meaningful conclusions. Research showed that **with sufficient contextualisation** and **good representation of information**, people with average knowledge tend to understand and appreciate data presented in the existing EPCs.

BG The Bulgarian contributors highlight a statement by one of their research participants, stating that "energy parameters are not clear," although they are indeed "very interesting" once they are meaningfully explained.

EE To make it more useful for end customers who basically don't understand kWh units, it would be easiest to add energy bill euros to EPC, i.e. annual electricity, district heating and fuel cost per heated area.

ES Trying to produce meaningful indicators, such as the ones used for cars would be valuable (consumption of litres of oil per each 100 kW with direct translation into money).

FR Focus group participants talking about to add an objective value to reach or at each step of the scale add an example. The number post on the EPC should be explain, a comparison with something more common (car's pollution).

HU The kWh/m^2a unit was also difficult to understand without explanation. They said they would like to see the energy consumption of the building in natural units (e.g. m^3 natural gas, kg wood, kWh electricity, ...).

HU The present format and content of the EPC is more or less good for experts, but very hard to understand for non-experts. They understand the labelling (A, B, C, etc.), which is good for comparing buildings, they also understand the proposed measures, but nothing else. It would be good to present the main results in simple sentences for them.

SE Most people want to make a good choice towards sustainability/carbon neutrality and be proud about their decision (be seen as a hero), however they need a bit of support from trusted sources because they are often confused and don't know to which certification scheme and metric they should base their decision. Solar panels are a trend in SE (you can also easily show off what you did), but those that design and install

usually don't have a clue about EPCs. People want to make a difference and would be ashamed to tell friends they didn't, for example you don't really want to tell your friends that you have an oil heat generator. (Architecture office)

Additionally, **EPCs have to be realistic** in how they communicate the results and measures. The case of listed historical buildings, pointed out in the chapter *Comparison*, illustrates why indicators and recommendations should be contextualized and presented with relative indicators. Failure to do so results in loss of trust in the EPCs, loss of perceived quality and usability, and even inappropriately realized measures.

FR Recommendations should be more realistic. Even if in France we use sometimes measured method thanks bills, EPCs are opaque regarding what they taking into account. Because of that the recommendation afterward are not in adequation with what users should refurbish or change.

The other way to state the same is that **EPCs should be case-specific**, tailored to the properties and the realistic scope of options of the concrete individual building. As pointed out by several research participants, **generalized measures are not desirable**.

FR Focus group participant agreed that they prefer to have nothing than to have bad advice or copy/paste advice, they would like something more personalized.

SE Generic recommendations are hard to act on especially since EPCs are too technological. Although challenging people need to be taught about energy and sustainability in buildings (at current EPC costs this is not implemented) in a social context (like cooking classes) making it fun and interactive and giving tailored recommendations in a constructive way not too technological. (Architecture office)

Measured -vs- calculated EPCs

As an example of data and information contextualization that could be included in the future EPC we will now look at **explanation of the gap between the calculated and measured EPCs**. This proved to be one of the more "confusing" aspects of the EPC scheme, which is strongly connected with the aspects of conceptual foundations and the methodology of EPC schemes. The gap appeared as a significant topic in various stages of the research. An example is the aspect of EPC use in practice, illustrated by the following report from Slovenia that touched on limitations of practical use of calculated EPCs.

SI *"Honestly speaking, we did not even bother to compare the actual energy use with the* [calculated] *EPC. Because it is based on assumptions… so, there are no facts, it's a simply a theoretical EPC."* (building manager)

In relation to this chapter, we look at the gap between the calculated and the measured figures as a case of content contextualization. The following report by the Estonian contributors indicates how this aspect affects on the one hand the perception of EPCs on the one hand, and the value of both EPC scheme and its impact on the other.

EE There is often a considerable discrepancy between calculated and measured EPCs. Current amount of data and its resolution in measured EPCs is often insufficient to pinpoint the root causes for the differences. This is naturally more evident when the

measured performance is worse and the resulting EPC category changes. As a result, the perceived value of the property is lower from the buyer's/renter's perspective. In the current iteration of the measured EPCs, only space heating is normalized with weather data, no standard user profile-based recalculation is done. A lack of adequate metering is mentioned as a primary reason for this, this is especially true for older buildings, as well as newer residential buildings, where the unit cost of such metering is high. As a result, the normalization of energy consumption data is largely dependent on the competence of the EPC issuer.

Although this is largely a challenge regarding the EPC method (see the chapter on *Quality*), explanation of this gap, some experts argued, could be the basis for proposing **measures tailored to real operational patterns of the building**.

DK The EPC should base on more precise calculations and it should be compared with the real energy consumption, in order to be reliable. Measures for better operation of the building and heating/air-conditioning systems could be also useful for building owners and users.

SE People are interested in real time data and it has both a nudging effect and educational impact. People use energy like air (no costs, no consequences). People need to visualize what's happening in their buildings and go through the learning curve like they did with temperature scales (nobody knew at the beginning what is warm and what is cold) which are now obvious for everyone. Very few people though have time to analyze historical data, they need data reasonably often to instantly trigger a response. (Utility company)

However, **experts do not unanimously agree** when it comes to defining whether or not to include the measured energy consumption into the EPC. As explained in the Hungarian case:

HU Several experts believe that inclusion of the measured energy would be useful for end-users. When somebody would like to buy a house, it would be great to know the real energy consumption and not only the calculated. The user profile and the indoor temperature affects the real consumption, but it is better to show it than not, because it is factual data.

In contrast, some experts believe that the inclusion of the measured energy consumption into the EPC may result confusion for end-users, since the indoor temperature, the user profile and plug-in equipment can be very different in the buildings. In Hungary, there is asset rating from the beginning. The operational rating is possible based on the law, but there is no established practice, and EPC issuers generally do not support it. The calculated value is comparable. The inclusion of measured energy consumption beside the calculated figure can increase time spending of issuers and costs of EPCs, which has to be carefully considered. In case of presenting measured energy consumption, the user shall be able to provide the consumption data, which is hard to do in some cases (some people do not keep the bill).

Complexity

The above brings us to complexity, which is another important aspect of EPC content. Besides the lack of understanding, which is largely related with lack of knowledge regarding different concepts (such as primary energy) or units (such as kWh), many research participants found the content of existing EPCs difficult to understand also because of **unclear relations between different pieces of data and information** included in the document.

ES Comments given by EPC issuers are sometimes unclear, repeat information and do not provide necessary context or explanation to render information given in the EPC useful. In addition, these comments are expressed in an ununiformed manner while some have virtually no expert comments whatsoever.

FR Everyone agreed that the table with primary energy and final energy (electricity factor) is unclear and create a confusion for the users.

As we have pointed out already, perceptions of the existing EPCs largely depends on how understandable and meaningful one finds the content of the EPCs, which is directly related with the individual's level of knowledge and interest. Both **the level of understanding and related meaning**, however, **largely depends also on the complexity, structure and design** of the EPCs.

BG *"I think that the EPC has enough information. If there are more details included, it could become incomprehensible to the users. It should be completely understandable, with short, clear and correct information, so that non-specialists could understand the meaning."* (building designer)

IT Mostly because of the complexity of the law, unclear information and cognitive overloaded, complexity of information has a negative effect on people's active acceptance of EPCs.

Our Dutch contributors reported that the Netherlands developed a simplified version of an EPC (VEL), which was generally positively accepted.

NL In the Netherlands we introduced a simplified label (VEL) in addition to the normal certificate. The issuer thinks that that is a good solution to get a rough idea of the status of a building and a first impression of the steps you might take to improve your house. That, however, should be followed by an advice of a well-trained assessor to help identifying the next steps for your situation.

There are, however, **limitation to which degree simplifications can be made**. As our Dutch contributors highlighted, such developments always have to be done with **consideration of specific contexts.**

NL For housing companies, the VEL was not a good tool, since that did not give a well enough overview of the status of their stock and they lost the communication tool towards their tenants. Also, most of the indicators on the label, other than the letter and the color do not add much. For housing corporations' letter, color and CO_2 savings would be enough. Most other indicators are unclear to their tenants.

SE EPCs should be simple, yes, still the process behind shouldn't be dumbed down otherwise it becomes meaningless because building performance is a complex process.

> The aim is to empower informed decision-making and avoid being generic, which is currently the case, individual advice is missing in practice. (Utility company)

Simplifying and streamlining the certification process goes beyond the idea of user-friendliness. Indeed it relates to the whole complexity of issues surrounding existing EPCs – from quality, to cost-effectiveness and wide base support. In this respect it is necessary to point out that **many experts characterized existing certification procedures as being "time consuming" or as a "serious administrative burden"**. All this indicates that simplifying and streamlining of EPC schemes – even if only for individual homeowners – has significant potential for improvement of the existing concept, which would make EPCs not only more user friendly but also, as we discuss later, make them more cost effective.

> **BG** *"Especially for the smaller buildings, it is possible to decrease prices, if most of the administrative requirements for the issuing of the EPCs are avoided – for the summary, detailed report, which are not so necessary for a smaller building, but really take a lot of time to complete the paperwork."* (EPC issuer)

The problem of complexity is therefore not exclusively one of the individual homeowners, but also other stakeholders in the value chain, as indicated by our Estonian contributors.

> **EE** The processes must be simple enough that the market and local government entities are willing to implement them.

Going back to the user's perspective, since there is a variety of different users ranging from highly knowledgeable and interested individuals to poorly knowledgeable indifferent individuals[1], we conclude that **future EPCs should be tailored to the users' needs, expectations, knowledge and interests**. As proposed by contributors from Hungary and Denmark, these could be EPCs designed in two-level (or parts) corresponding to two different levels of complexity of information:

- **1st level/part** designed specifically for average (non-professional) users; focused on buying/selling a property, energy management, practical directions for improving building's EE.
- **2nd level/part** for professionals, containing more detailed and technically specific data; intended for both experts and advanced users.

A further step from that would be providing **several levels of complexity** – for example basic, intermediate, advanced and expert – or even a **modular design**. In combination with **digitalisation** in direction of guiding adequate use of building and its systems, this could enable users to tailor their EPCs for themselves. It could also enable **interactivity** and potentially **moderated learning progression** of users also how to efficiently use building and its systems, starting with basic information and proceeding through different levels of complexity – from basic towards expert, depending on their own needs and interests. But before focusing too much on such radical developments, let us look at some design aspects that are reasonably easily applicable on the existing EPC schemes.

[1] Here we avoid referencing disinterested individuals, be it knowledgeable or not. These are (hypothetical) individuals who have no interest in EPCs or its related field and are highly likely to never be compelled to use or care about the EPCs or related topics. Indifferent individuals, on the other hand, are ones who are passive but could potentially be compelled to use and care about EPCs with the right balance of user-centred contents and design.

Design

U-CERT research shows that if people are presented with the existing format of EPCs, they tend to have difficulties understanding them.

ES The main weakness is the abstractness of the document to the public. The unit kW does not mean much to most people. One additional item that is perceived as a weakness is the fact that lighting consumption is not included in the residential EPC, also that the photovoltaic self-consumption without batteries is not very well considered in the current EPC framework.

Effective presentation of information is a key first step towards rendering EPCs as a useful and meaningful tool for users. This certainly includes aspects of education, knowledge transfer and interactive, perhaps even co-creating processes and activities, which could be integrated in the existing EPC schemes.

DK Since most normal building owners and users have difficult to understand the EPC report properly, it is necessary to provide some education to the non-expert users to make them part of the process, describing the actual condition, the results and the proposed measures in an ordinary language.

HU If the users do not have the basic knowledge to understand the results of the EPC and the importance of the energy performance of their homes/workplaces, the user friendliness itself does not solve the problem.

HU Front and second page of the current EPC is more or less clear, but the rest are impossible to understand for non-experts. The new EPC should have explanatory parts on the existing condition of the building and its technical systems and also on the proposed renovations,

IT *"The user must be involved in order to better understand the way in which the intervention is carried out."* (EPC user)

With regard to **user experience,** organisation of data, transparent referencing, contextualization, visualization, language use and related aspects of data organisation and communication are absolutely essential.

BG *"I saw a certificate in which, the technical characteristics of development proposals, their effect with explanations and figures appeared on separate pages. This could be a good direction for development."* (EPC expert)

HU As pointed out by one of the research participants, most important parts of EPC should fit on the front page or in worst case at the 2nd page. Calculated annual delivered energy consumption and energy costs could be included on the front page in connection with the existing condition and energy saving measures, of course with detailing the boundary conditions.

Indicators, visual features and language have proven to be one of the most frequently commented design features/properties of existing EPCs. Before looking at them more in detail, here are some generalized conclusions regarding EPC design:

- **Explain units and concepts.** Participants had issues understanding concepts, such as primary energy, energy demand, energy consumption, life cycle cost analysis, etc. The kWh/m^2a unit was also difficult to understand without explanation.
- **Provide relatable indicators.** Participants would like to see values presented in the EPC in units they can relate with and understand. For example, energy consumption of the building in physical units (e.g. m^3 natural gas, kg wood, kWh electricity, ...).
- **Everybody understands (energy) costs.** Many participants pointed out that annual energy costs of energy sources (natural gas, electricity, district heating, wood, pellet, ...) would be very useful if included in the EPC, because everybody understands it. Furthermore, the potential energy saving of the proposed measures should be also expressed in costs.
- **Provide explicit type of information.** Need was expressed for clear indicators, such as YES/NO. Adequacy of indoor climate (at least category III or better for YES, otherwise NO) has been given as an example. In this case, criteria could be based on HVAC systems assessment from design documentation or on-site visits.
- **Explain the methods.** Hungarian contributors pointed out that in the existing EPC it is not clearly explained how the energy class is achieved. They suggested that the percentage limits of different energy classes (e.g. category C is from 101% to 130%) could be shown in the pictogram, which shows the energy classes and the achieved class.
- **Tailor the language (complexity) to the user profile.** With regard to suggestion of different levels complexity of information, the complexity of information could be tailored to the knowledge level of the user profile.
- **Provide user-tailored modules** with different levels of complexity of information (e.g. basic, intermediate, advanced, expert user).
- **Less is more.** Wherever possible, reduce the quantity of presented data and information.
- **Prioritize presented information.** It matters which information is presented in which part/section of the document (1st page, 2nd page) and how individual pieces of data are connected to each other (signposting, graphical presentation, contextualization, referencing).
- **Provide a legend/key** or a glossary of terms. This should include explanations of technical terms and concepts presented in the modules.
- **Provide a summary**. Many lay people asked to include one page summary for non-professionals, describing the actual condition, the results and the proposed measures in an ordinary language.
- **Clearly present the relations between presented data and information.** This goes both for structure of information why an individual data point is important)
- **Provide case-specific measures**. These should be tailored to the individual building and ideally be presented in a couple of scenarios (financially optimal, energy-efficiency optimal, recommended, etc.).

Indicators

The correlations between EPCs and practical, achievable, and financially viable building maintenance measures is described as not clearly presented and/or communicated properly. For this, **need has been stressed consistently for reliable and relatable indicators.** As a general term, we understand good indicators as meaningful (comprehensive and relatable) and reliable data points.

As an example, one of the most frequently referenced indicators is the **estimated billed energy costs.** Research participants described it as a reference that would present a "tangible value" for all users, disregarding their knowledge background.

> **ES** It is recommended that the certificate makes an estimate of the amortization and the return time of the investment of the equipment based on the energy savings achieved.

However, a counterargument for this was also given – doubts about accuracy and comparability of the cost between different regions and energy suppliers. This could potentially create significant issues, as our Estonian contributors report.

> **EE** Discrepancies in the estimated and actual prices could open the backdoor for legal ramifications and negative media feedback.

As a potential solution, it was suggested to show only some of the **past energy bills** along with measured EPC values.

> **ES** It is very interesting that the rating is separated in terms of demand and consumption, because it gives indications of how the architecture of the building is resolved before including the facilities. It is also interesting that it is separated between heating / cooling / DWH / lighting since it allows focusing on possible improvement measures in the building that may be applied in the future.

> **SI** *"Energy viewpoint is a minor segment of decision* [when buying a housing unit]*. The thing that EPC does not have, and people are more interested in, is – tell me how much you pay for heating."* (building professional; real-estate agent)

Certainly, contemplation of the question of which indicators should be included in the future EPC and how they should be presented is needed. As illustrated by our Dutch contributors, **existing indicators have a limited impact and purpose**.

> **NL** The indicators on the label are now all political indicators but give no information to the end user. We have agreed internationally to put these on the label, so they are placed on the label. Are these indicators tested? Do they work? The same goes for the label itself: does that work to get people moving? Maybe we need to do different things instead?

Visualization

Visualisation proved as arguably the **most positively perceived feature of existing EPCs**. The strongest element of the existing labelling is the colour-scale combined with ABC categorisation of the property's energy class.

> **SI** *"It's a sort of relief to see that you are in the green."* (building owner)

This has been consistently described as the strongest element of the EPCs, generally described as easy to understand and **relatable to energy efficiency labels on home appliances**.

> **BG** *"They look a lot like the certificates for the electric devices."* (building buyer)

Other visual features of EPCs, such as diagrams, photos of the building, or simply the segmentation of the documents into logical units, have also been pointed out as positive. They also called for **more visual elements** and clear **representation of how different information** provided in the document meaningfully **relate to each other**.

> **SI** *"More references, connections, what means what. There is a lot of some terms and information which we can't understand. And why are some of these data here in the first place?"* (building owner)

Visual (graphical) representation of information is very important for the overall user experience of the existing EPCs. This property should therefore be maintained and further capitalized in future developments of EPCs

> **FR** Focus group participant want to structure and highlight the recommendations in order to make it easy to read (icon, keyword in bold, color)

Language

Language used in existing EPCs proved as problematic. Many research participants complained that existing EPCs are largely incomprehensive for general users.

> **ES** It is a very technical document and a user would focus only on the labels is what has more internalized would not enter the technical terms. More colloquial references would have to be "translated" into terms for the user to understand.

> **SI** *"I'd like 'subtitles', as to what this means. To describe why this is considered good. If it says you are in the C category, it would be good to know what exactly this means. In a simple way."* (building owner)

While existing EPCs are comprehensible and manoeuvrable for people with considerable (technical) background knowledge, which are relatively few, future **EPCs should be understandable also for people with no considerable knowledge to a degree that the majority will find them at least interesting or, more importantly, useful.** To achieve this, most research participants expressed **the need for a key and legend**, or rather, **a glossary of terms** that explains the concepts, units and parameters used in the document.

Service

EPC schemes can be regarded as a combination of certification services and the EPC as a product. We have already looked at product design. Before moving on to the following chapter, we want to stress the concept of service design. Most significantly, our research indicates that **providing easy and straightforward access to information** should be one of the key features of future EPCs.

BG *"The society should be better informed – about what are the conditions that the dwelling should provide, the modern conditions… We are in 21st century and we have to secure the best possible living environment."* (building occupant)

IT People expect a simpler approach to EPCs with the use of tools that allow them to understand consumption and above all the opportunity to speak with experts in the sector.

This could mean either **providing the information within the EPC** in form of content or directing users to a reliable source of information (e.g. online sources, support services, …).

BG *"When I did my renovation, the norms changed during the process… I put 5 cm of insulation over my existing 10, and now I wish I put another 5 to make it 20. But I didn't have the reference point. What could be done? I think a simple calculator accessible online could be very useful to calculate the U-values and compare them to different benchmarks. If the U-value of the wall is 2, people should know they have nothing and they need serious measures. If it is 0.5, we should know that the reference norm is 0,25."* (building designer, NGO chair)

Other option is providing some form of **customer support.** In case of the existing EPC schemes, this seems to be limited to the **interaction between** the **certification service providers (EPC issuers)** and their **customers**. Some research participants therefore argued that more emphasis should be put on this aspect of the certification process.

FR Diagnosticians (EPC issuers) are often not able to sufficiently explain the purpose and objective of conducting an EPC. Include in their training course a short speech to define and explain the challenges of energy performance. This would allow the user to understand this document.

However, this could also be understood wider. For example, several research participants pointed out that there is no **access to consultancy or advice services** for end-users at any level. Consequences are various, from people tending to believe information from informal (non-expert) channels, to absence of motivation to look into the problem etc. In the following chapters on *Quality* and *Wide base support*, these topics are discussed in further detail. At this point, we stress this as a potential for development of new user-centred EPC services for the future.

5. QUALITY

The principal vantage point of U-CERT project is that EPCs across the EU should have the capacity to facilitate convergence of **quality** and **reliability**. Experience with the existing EPC schemes shared by our research participants show the need for increasing this capacity. We defined several possible approaches towards addressing this challenge. Among other, these include improved methodologies for calculation and monitoring of building energy performance, ensuring a technology-neutral approach, transparency, and use of international (EU) standards. Both in its conceptual and practical form, EPCs should be established as **credible** and **holistic**. To achieve this, clear, unambiguous, and meaningful information on measured energy performance, IEQ, and related impacts on health and wellbeing are necessary. This also includes functionalities and implicit potentials of **Smart Readiness Indicators (SRI)**, which is briefly discussed in the second section of this chapter. In addition, a rigorous quality control and skilled workforce should be regarded as a necessary predisposition.

Opinions regarding future developments of EPCs vary substantially. With regard to the existing EPC schemes and their qualities, we encountered a variety of opinions and attitudes. Most research participants with a strong opinion regarding the topic, majority being experts in the field, advocated for some form of change and improvement of the concept. Some even point it out as an “urgent” matter. In contrast, a few experts refused such ideas, saying that change is unnecessary and characterizing their national EPC scheme as good or “good enough”. In the following chapter we will look at some of their comments and suggestions broadly related to the notion of quality but also other key aspects discussed in this report. The chapter is divided in four sections. The first section lists suggestions for improvement. The second highlights some technical points of EPCs as a product, some related also with EPC method. The third is focused on the quality of EPC services, especially the qualities of EPC issuers’ profession. The final section is focused on quality control.

General outcomes

Suggestions for improvement

Measures to tackle this issue voiced by U-CERT research participants include:

- **Promote, raise awareness, educate.**
  - Enable educational content for non-expert users.
  - Improve and maintain education for EPC-issuers.
- **Improve quality control (EPC method & system).**
  - Create a transparent and reliable certification system.
  - Introduce a model of commissioning/follow-up to check the results from EPCs with the actual energy performance of the building/property.
  - This requires either comparably high quality (utility) of EPC services or a sustainable state-funded system, depending on who the main beneficiary of the EPC services is.
- **Increase quality control and standards for work of EPC issuers.**
  - Recognize and reward exceptional performance (high quality of work, good customer feedback). Recognition is considered just as important and effective as sanctioning poor performance.
  - Introduce and/or enforce penalties for underperformance. Failure to comply with existing regulation should be strictly regulated and enforced.

    - Collected penalties should be spent towards the improvement of EPC products and services.
- **Reset the cost-benefit balance.**
    - Increase the value (price) of the issuer's working hour. (motivation for EPC issuers)
- **Integrate EPCs with new technologies (digitalisation) and other building performance processes e.g. energy audits, inspections of building services.**
- **Provide more useful information**
    - Development of EPC concept to include more useful information for both expert and general users.
    - Connecting EPCs to everyday life (continuous monitoring, building interactions).
    - Include or provide integrated (easy) access to information that goes beyond the purely technical aspects.
    - Tailor measures and recommendations to the individual household/building.
    - EPCs should be made an easily accessible and transparent source of information, providing references to different benchmarks.
- **Improve the methodology.**
    - The methodology should be balanced and account for all elements of the building/property – systems & envelope – as well as the practice and purpose of use.
    - Decrease the gap between the calculated and measured (real energy consumption) EPCs.
- **Reconceptualize the EPC into a tool for regular energy performance assessment.**
    - Include data and information also regarding the heating and cooling demands [in kW] as key systems design criteria and relevant information for future peak reduction.
    - There can be significant deviations from actual energy consumption data in the results of the current calculation. Deviation from real energy consumption should be e.g. ± 10% taking user profiles into account. Certification would not be a one-off occasion but monitoring the energy consumption of the building could also be a consideration, or actual consumption data should also be taken into account in the certification.
- **Simplify the certification process for households.**
    - Some experts argued that EPCs (or the certification process) for non-commercial individual residential buildings and dwellings should be made simpler and less consuming, both form time and financial perspectives.
    - Many experts suggested that EPCs are integrated with already existing and established processes, such as issuing building passports, energy audits etc.

Quality of the EPC method and related aspects

Technical aspects – CALCULATION METHODOLOGY and related aspects

The technical side of the existing EPC schemes was not the focus of U-CERT ethnographic research. Nonetheless, to provide depth and character to the concept of EPC schemes and EPCs as products, here are some key points raised mostly by research participants with expert background knowledge reflecting on the technical (measurable) qualities of EPCs:

- **Lack of consistency within the existing method.** Several experts complained about inconsistencies within the method, such as pieces of calculation software, which do not present the results in the same format.
- **Reduce the gap between calculated and real energy consumption.** A calculation method should be developed that reduces the gap between the calculated and the real energy consumption.

The difference between the two should also be concisely explained (explanation of strengths and weaknesses of the calculation methodology, "level of technological obsolesce", …).

- **Existing (static) calculation methodologies** used in EPC systems are not suitable (or compatible) with new technologies available on the market, which could potentially be integrated in EPC schemes.
- **Lack of appropriate measurement systems.** The processing and evaluation of data based on measurements should be part of the new EPC. As pointed out in the Hungarian case, certification should be based on calculations, but measurement-based data processing is also required to support the adequacy of calculations. The development of current measurement systems is needed in order to present the energy use of technical systems. In existing EPC schemes, the asset rating is usually more suitable for comparison of buildings. In the operational rating, the user habit can be an influencing factor, despite the effect of the necessary corrections.
- **Overly simplified calculation methodology.** In Denmark some experts from various U-CERT case studies (e.g. HVAC engineers and architects) said the EPC calculation software is overly simplified, which compromises the quality of EPCs. (DK)
- **Measured EPCs should progress toward dynamic solutions** – (sub)metered data, e.g. a live rolling 12 months EPC. EPC database could collect automatically energy data from main meters (for instance monthly cumulative values) (EE)
- The main strength is that provides a good indicator about the building behaviour in terms of heating and cooling needs, for instance. This helps backing up certain architectural designs which may rely, for instance, in bioclimatic strategies. (ES)
- **Reduce the validity period.** In several countries the EPC is valid for 10 years. Expert suggests decreasing this period to improve control and tracking of the building/property's condition.

Smart readiness indicator (SRI)

One of the goals of U-CERT is to explore implicit potentials of digitalisation of EPC schemes and its integration with **Smart Readiness Indicators (SRI)**. U-CERT assumes that EPCs should have the capacity to increasingly reflect the smart dimension of buildings by means of digital supporting tools. An important part of this is the calculation methodology Smart Readiness Indicator for Buildings, which will allow for rating the "smart readiness" of buildings – the capability of buildings to **adapt their operation to the needs of the occupant,** optimizing energy efficiency and overall performance, and to adapt their operation in reaction to signals from the grid.

As an integral part of digitalisation of EPCs, which we have partially discussed in the chapter *Characterizing EPCs,* the SRI should raise awareness amongst building owners and occupant of the value behind building automation and electronic monitoring of technical building systems. It should also invoke confidence in occupants, providing them fact-based information on relation between (potential) savings and EPCs' enhanced functionalities. Extent to which we managed to explore these possibilities was limited. Majority of research participants agreed **digitalization presents a significant potential for future development of EPC schemes. Some suggested that digitalization has the potential to bring together several buildings related process that seem unsynchronized at the moment**. Much fewer, however, had an opinion regarding SRI, mostly because of lack of knowledge regarding the topic. This could be explained at least partially by the fact that SRI is a relatively new concept in the field.

A significant contribution regarding integration of SRI in future EPCs came from our Hungarian contributors. They concluded that most important elements of the simplified SRI investigation may be included in the EPC as an optional investigation. One of their research participant stated that the voluntary certification of SRI is a complex process and should not be fully included in the energy certification. Report from France substantiates their claim.

FR *"For a private individual it [the SRI] is not essential, it's something visible, simple to see at first glance but maybe for tertiary buildings where the systems will be more complex it could be useful."* (EPC expert)

Other related points shared by Hungarian experts are the following:

- It is clear that **not all EPC issuers will be able to make smart readiness indicator (SRI) calculation**, but can be a group among EPC issuers who have/will have the knowledge to make SRI evaluation. The inclusion of SRI aspects in the EPC can be a good way, however, as reported by our Hungarian contributors, it is not decided yet when and how to introduce SRI certification.
- **Most important elements of the simplified SRI investigation may be included in the EPC as an optional investigation.** The voluntary certification of SRI is a complex process, and should not be fully included in the EPC, because in several cases the user has **limited** influence on the "smartness" of the property, for example an apartment owner in a block of flats, where are central systems in the building.
- **Including parts of SRI into the EPC should be relevant for big buildings and especially for new constructions.** Knowing SRI of building units, especially in apartments in a block of flats probably does not provide so much added value for the user as it has very limited chance to increase smart readiness of the apartment. Some most important parts of SRI, like heating control, or control of AHUs may be useful to emphasize in the EPC, but only in big buildings (offices, sport facilities, etc.). Nonetheless, local energy grid interaction via local RES based production, energy storage and electric mobility should be addressed by both concepts.

Experts in Sweden rather see the **SRI as an enabler and facilitator for integration of all building performance processes** that would also pave the pathway to measured and operational building performance and would support the use of additional indicators e.g. IEQ. It needs though to be implemented and communicated in a clever way and it is perceived that it should have a strong relation with EPCs because it's also part of the EPBD.

User type – purpose and practice of building use

An **important aspect of EPC quality is how realistically it reflects the actual energy consumption of the property**, or rather, the practice of building use. Generally speaking, this involves two key aspects:

- **Culture of use** or how the people using the building and its systems actually use and manage the built environment (human-building interaction is most relevant to achieve efficient energy use and ensure high quality of indoor environment). This aspect stresses the individual and collective capacity to interact consciously and responsibly with the built environment in order to maintain an optimal balance between energy performance and desired functionality of the building.
- **Purpose of use** or how the established practices and patterns of use relate to the specific built environment. This aspect stresses the functionality of space(es) and buildings related to their designated purpose of use. Purpose (e.g. office use, education, recreation, service, commercial, residential, …) encompasses certain patterns of use that can be accounted for, predicted and managed. This is aspect is often reflected in the difference between the calculated and measured energy performance of the building.

The existing EPCs do not account for these, which effectively results in two things. Firstly, **the existing EPC does not represent the factual energy performance of the building**. To illustrate, a building with the same calculated values of energy use will likely have very different real-time energy performance depending on **the way** and **by whom** it is being used. Many agreed that EPCs should be improved to include indicators (e.g. age and number of users) reflecting these aspects.

ES Occupancy and performance levels are not indicated on the certificate, which would be very useful information.

FR A building can be displayed as performing (with a good score on EPC) but in reality, it will consume much more because each user of the dwelling has his own lifestyle, comfort, habit...

IT For the end user the EPC is not directly very useful because the actual consumption, strongly dominated by the way the building is used, can be significantly different from what they would expect; it can possibly be an indicator of good management, but to be understood in this sense it is necessary to educate the users more.

Measured EPCs are arguably closer to reality, however, the performance is closely related to contextual factors and individuals as it is with the particular practices of building (system) management. It is necessary to recognize, however, that **not everyone believe it is necessary to actively seek improvements of the existing EPC concept in this regard**.

BG *"I believe the certificates could be trusted as there is a methodology that is followed. Of course, in many cases it is a calculation of the 'ideal' consumption of the building and the actual situation could be additionally considered, but in general it is close to the reality."* (building auditor, EPC issuer)

As we have pointed out earlier already, many also do not recognize EPCs as a tool that could be used by general public in the first place. Notwithstanding, since U-CERT is specifically interested in making EPCs

more user-centered, we conclude that **EPC methodology should evolve to account for the aspect of its use** if its purpose indeed lies also in its service to people in their everyday life.

SI *"EPC should be made so, that it would ask us what our needs are. That it would suggest measures, such as putting on a sweater or to take the stairs* [rather than the elevator]. */…/ The goal should be nudging the users to be constantly present in a given environment and situation. And at the same time catching the balance between too much distraction and spreading information efficiently."* (building expert)

SE EPCs currently only take into account the energy use of certain building services and completely neglects the one directly impacted by people's day-to-day activities e.g. plug loads. This needs to be improved. (Energy efficiency services provider)

Quality of EPC services

Quality of EPC services has been frequently pointed out as problematic by both experts and general-users. Again, it is important to emphasize that **opinions in this regard were often contrasting**. Some participants believe that existing EPC products and services are generally reliable and of good quality.

BG *"Many of the requirements that are perceived as 'future' in other countries, are already functional with us."* (public authority representative)

"Everything what is needed is there – energy consumption before the measures, energy consumption after the measures, information about the heating, ventilation, everything. I don't see at all what should be removed or what should be added." (public authority representative)

BG *"We have well prepared, very strict, very serious rules as pertaining to the quality of the building audits and the qualification of auditors. Many of the requirements that are perceived as "future" in other countries, are already functional with us."* (public authority representative)

HU *"In my experience, in the case of two flats in which I had previously lived, the energy performance certificates well reflected the energy characteristics of the flats."* (EPC user)

Others believe that EPCs are a good theoretical concept that has a poor realisation in practice.

BG *"The Bulgarian methodology for calculation of the energy performance characteristics is comparatively good; however, the control over its application is missing. Thus, the good intentions of the legislators are compromised on practice and the quality of the implementation is not sufficiently good."* (EPC issuer)

HU In Hungary, the quality of EPCs is generally good and issuers believe this will continue in the future. However, false, unsubstantiated EPCs that can be misleading cannot be completely filtered out.

Finally, a significant number of both experts and users believe that EPCs have issues both in theory and practice.

To measure quality of EPCs, certain things have to be clear, such as the purpose of EPCs, and what the desired outcomes of issuing an EPC are.

NL The basis of a design and renovation should be a healthy house. But it is better not to mix energy performance with health performance, because that over complicate things. "My own house does not meet the overheating requirements, but I actually don't find that disturbing", the issuer says. In the Netherlands we introduced a simplified label (VEL) in addition to the normal certificate. The issuer thinks that that is a good solution to get a rough idea of the status of a building and a first impression of the steps you might take to improve your house. That, however, should be followed by an advice of a well-trained assessor to help identifying the next steps for your situation.

NL For housing companies, the VEL was not a good tool, since that did not give a well enough overview of the status of their stock and they lost the communication tool

towards their tenants. Also, most of the indicators on the label, other than the letter and the colour do not add much. For housing corporations' letter, colour and CO_2 savings would be enough. Most other indicators are unclear to their tenants.

Importantly, **EPCs also have to enjoy a good level of trust** both among EPC experts as well as their users, which has proven not to be true in many cases.

FR Région Nouvelle Aquitaine (South west of France) is developing a "sustainable building assessment methodology" (Bâtiment Durable Nouvelle Aquitaine) in order to support environmentally friendly buildings. We participate to this project within focus groups for each topic of the assessment methodology (project management, energy, materials, water, comfort, …). During the Energy Focus group, we talked about EPCs and asked if it was a good indicator to evaluate the energy rehabilitation. All the participants (engineers, architects and project managers) voluntarily chose not to include the gain in energy rating by EPCs in the criteria because it was not sufficiently reliable.

As we have already indicated, making EPCs more user friendly from a product (and content) design perspective is important. However, as illustrated in the following report from the Netherlands, this is only one part of the problem.

NL Expressing energy use in kWh/m^2 as it is used now is also not understood by end users. And that is not solvable by the lay-out alone. We now have an explanation on the certificate what is meant by kWh/m^2, but that is more a disclaimer than that it helps the end user. Adding a KPI on overheating does not make it easier for the end user.

In search of improvement, we now take a closer look at some aspects of certification services with particular emphasis on work of EPC issuers and quality control.

Responsibility of EPC issuers

Many U-CERT contributors reported that existing system of EPCs largely relies on **individual responsibility of EPC issuers to perform well**.

BG *"It is presumed that the company that issues the building certificate is licensed and bears responsibility for the quality. They are subject to sanctions. We completely depend on their responsibility."* (public authority rep.)

EE The quality and responsibility of EPC issuers must be high enough to discourage dishonesty during the modelling and calculation procedure.

RO *"Since quite long-time in Romania there is an official scheme forcing the EP auditors to prove their life-long-learning activities and present a recommendation from a professional association."*

SE EPCs are considered reliable, however when issues appear they are due to human error and not the calculation methodology. This basically then is linked to the EPC issuer's responsibility. (Building services designer)

Some research participants blamed low quality of EPCs on various aspects of **poor quality of work done by the EPC issuers,** which we discuss further in the following section of the chapter. There were also several **accusations of data manipulation with the aim to fabricate desirable results**. In several case studies research participants pointed out that data used in the process of issuing EPCs is being manipulated – most often on the incentive (by pressure or corruption) of the clients – in order to reach desirable outcomes. Such manipulations happen **either to project a better-quality housing** (energy class of the property), which potentially improves the market value of the property, **or to project poorer quality of housing**, which in some cases gives owners/investors competitive advantage when applying for funding schemes (grants or subsidies).

In this respect, **question of quality and reliability converges with the changing nature of the function of EPCs**, as highlighted in the introduction to this report where we explain how EPCs have a different function for Experts on the one and Users on the other side. In this case, as illustrated in the following statement, **the function of EPCs changes within the User's perspective,** depending on the Users's interest and intention.

BG *"When the investor is building to immediately rent and sell, it is all about completing the documentation* [fulfilling the administrative necessity]*. If there are long-term goals to use the buildings, then there are requirements for quality."* (facility manager)

And finally, this is also closely related with **lack of trust** towards EPC schemes, a concern expressed by several research participants, saying double standards are sometimes applied. Several even implied possibility of **illegitimate business practices and corruption**.

BG *"I used to be a member of the professional association C., but I am distanced from it because of the way they work. They should maintain the professional standards but it seems to me they are driven by external interest."* (energy auditor)

SI Several informants have indicated, that illegitimate business practices are part of the broader field of EPC schemes. A given example, from a contractor, was building/facility managers demanding/expecting percentages of EPB investments from potential contractors in exchange for being chosen for the job. Another example, given by EPC concept developer, was delegating tasks (and funds) related with developing the national EPC scheme on the basis of affiliations and acquaintances rather than quality and necessary qualifications. Such practices cause distrust on the side of the users and business difficulties on the side of the experts and expert users, especially different types of building professionals and contractors.

Although important, individual responsibility of EPC issuers to do their work properly is not to be regarded as the exclusive factor impacting the quality of EPCs. As shown several times by now, there are issues with the existing calculation method, changing technology and expertise in general. On the other hand, **responsibility for quality from the systemic point of view largely falls to the regulators,** who should ensure a reliable, transparent and effective system of quality control, that will drive the maintenance and development of quality standards. Poor quality control systems are liable to failure and compromised quality. Before looking at quality control in further detail we will look at another important systemic factor that reportedly has a significant influence on the quality of existing EPC schemes – education and training of EPC issuers.

Education, training and licencing process for EPC issuers

Concerns have been raised in several U-CERT partner countries **regarding the qualification of EPC issuers.** Our Estonian contributors illustrate this with a case of "low proficiency" of the EPC issuers, which also shows the issue of missing data for the measured EPCs. As they say, data analysis is often not carried out and measured energy values are used as they are, even if erroneous.

EE Residential apartment building reported energy use is very low – it was only general electricity used, missing the energy consumption of each individual apartment. Deduction from the EPC issuer was that energy consumption just was very low, without further looking into it.

FR *"Today we see houses that are energy sieves and yet they are classified as C or D. One wonders how that's possible, even though it's done by state-certified diagnosticians."* (EPC expert)

Comments regarding work done by EPC-issuers were not uncommon. In this regard **education of EPC issuers** has been consistently reported either as one of the weaknesses of the existing EPC schemes or an important part of EPC quality.

SI *"Is there a continuous educational process? They* [the issuers] *should be bound to constant renewal of knowledge."* (facility manager)

Slovenian contributors reported concerns about **who *is* and *should* be eligible to enrol the educational process** to become a certified EPC issuer.

SI *"Look, the principal sin of this method is that anyone can do this* [issue EPCs] *not even knowing what they are doing. I mean, it is well known which expertise covers this field… what is covered by civil engineering, what by mechanical engineering. And with this* [the existing method for EPC issuers] *the practice has been completely devalued. /.../ As a result, some landscaper* [landscape architect] *can issue an EPC not knowing what an axial ventilator is…"* (scheme and concept developer)

IT These certifications are so popular and given the fact that they are mandatory in Italy, a lot of people, even not properly expert, become energy certifier ruining the market both economically (with too low prices) and technically (with incorrect certifications).

Significantly, several contributors also pointed out that **education of EPC issuers has not been consistent** in the past couple of years. Although there is a reasonably large number of well-informed and quality issuers on the market, they argued that educational activities should be improved, which is especially significant point with respect to the expected developments of the EPC schemes.

BG *"At the moment, the certification is not operation. Although there is a very good description of what is needed and what are the requirements for certifications, for many years now there are no courses. (…) At the moment, there is no opportunity for updating the knowledge and acquaintance with the new technologies and standards."* (EPC issuer)

ES When EPC started, there was a lot of training and it seems that it has decreased through time. Also giving EPC experts some kind of recognition could boost the reliability of EPCs.

NL It is important that people understand the EPC. With the new NTA8800 the EPC probably became even more difficult. People that must use it for the assessment of buildings do not understand what they are doing: “it is like a magic box that gives some outcome”.

Some contributors also pointed out that **EPC issuers can (or should) function as a sort of consultants**.

DK The EPC issuer should also talk with the building users to understand the real performance of the building before starting the calculations. In most cases, the EPC issuers did the calculation purely based the materials properties by estimation not the real measurement of individual home.

Again, such ideas are relativized by contrasting opinions as some experts believe this is not and should not be the role and responsibility of EPC issuers.

What is more, reports included statements referring to indifference and disinterest of clients when it comes to consultancy and explanations offered by EPC issuers.

In relation to education and training of EPC issuers the following observations were also highlighted and/or suggested:

- **Raise standards for eligibility**. Some experts stated that type and level of education should be considered as part of the eligibility criteria for training for EPC issuers. Some pointed out that qualification courses should (continue to) be expanded and closely integrated in existing educational contents, including related university curricula.
- **Establish a continuous education system**. As above, education system should be continuous, not as a single event of training and acquiring the qualification.
- **Capitalize on the pool of existing knowledge and experiences**. Research participants highlighted, that there is a large body of knowledge and experiences from the past years of certification which should be prioritized (capitalized) in pursuit of improving the existing EPCs.
- **Improvement in this area must be parallel to other actions.** As argued by Hungarian contributors, improvement in the area of education of EPC issuers will not help if EPCs as products do not offer reliable fact-based value for the user.

Quality control

Quality control proved to be one of the central topics. Not only it was described as complementary to the quality of service, but often as **equally important as the quality of service itself.**

ES The most important thing is that the Regulatory Framework has to guarantee the energy efficiency as an added value and that the professional practice around it implies responsibility.

IT Still so much confusion and several critical issues to overcome: from the lack of homogeneity of the regional regulations, to the phenomenon of 'fake' certificates, passing through the absolute lack of control mechanisms.

Although recognized as important and enshrined in public policy, our research identified a general **lack of quality control** in the existing EPC schemes. This is illustrated by the following statements.

BG *"At this moment of time, the main thing that could be done is to increase the control, so that the auditors themselves would bear responsibility for the quality and should be penalised for submitting of incorrect results, manipulating results, allowing basic technical mistake. This, form one side, would increase the price, but on the other, would guarantee the quality of the services."* (EPC issuer)

EE There are currently no guidelines or control mechanisms for local governing authorities for measured EPCs, as opposed to calculated EPCs.

ES There is a need to set up minimum QA/QC protocols of EPCs ensuring their reliability, entailing a greater recognition by the population allowing experts to demand greater fees and improving their professional competences.

SI *"One of the key problems of EPCs, that we are detecting now, is that there simply is no control. No one does anything if there is no EPC or if it is completely incorrect, in a way."* (product and service provider)

The above commentary can be read as a barrier as well as an opportunity for EPC quality. How exactly control should be ensured and enabled is one of the challenges facing EPC scheme and concept developers. Some suggested **third-party control.**

BG *"The control should come from third parties. If it is an energy auditor or something else, I don't know, but there should be control from a third party if the measures should be applied properly."* (facility manager)

An example of (independent) third-party control was reported from France in relation to the issue of variability of certification results.

FR This problem of classification has been pointed out by a study of a consumer association (UFC-Que choisir). They have revealed that for the same house, 3 different classes have been assigned to it (E to G).

A related aspect is also **peer-reviews.** Bulgarian contributors point this out as a driver for improving overall quality of EPCs.

BG With the existing system being based on EPCs confirming the results of the renovation actions based on a previous audit, the risk of being assessed as "low-quality auditor" by peers is an important driver of quality.

Another suggested approach, which can also be seen as complementary action to quality control**, is commissioning for new or retro commissioning** as a process of assessing a building's performance and taking steps to return it to the original or new design parameters.

HU For example, in the case of office buildings, the energy model on which the certification is based could be tuned one year after the certification.

SE The optimum way to ensure actual quality control is by closing the simulated – measured compliance gap making follow-up checks mandatory and going to hourly time steps for building performance data. This would also support the meaningful introduction of additional indicators e.g. IEQ, SRI and make the whole processes

trustworthy and actionable, otherwise it remains an opaque process that you just need to do without any measurable impact. (Real estate developer)

Furthermore, the Danish contributors suggested that **quality control** could and should (ideally) be possible to be carried out **by the end-users themselves**.

DK Normal building users should be able to easily verify the quality of the EPC by comparing the real energy consumption with the calculation or estimations given in the EPC.

Regarding the latter there are several challenges. For one, existing **EPCs often do not have the necessary qualities** that would enable such monitoring, disregarding the level of knowledge of the users. For two, general users typically do not have the capacity to assess the quality of EPCs. **Evaluation is very difficult or impossible**, even for experts. Finally, most of the existing **general users have no specific expectations regarding the quality of EPCs**. If they want it or not, individuals and institutions who order the certification have to trust the EPC issuing system and the adhering systems for quality control. This brings us back to the reported issue of doubts regarding both quality of EPCs and the quality control system.

BG *"It all depends on the state and on the control it exercises. The measures are prescribed, but if there is no control, we tend to do it 'in the Bulgarian way' and only care for the documentation."* (facility manager)

Quality control reportedly *does* exist in most of the U-CERT countries. Compliance with standards, however, is not being properly enforced. Many research participants therefore blame lack of quality less on absence of quality control and more on the **lack of enforcement of regulations regarding EPCs**.

BG *"Forbidding buying and selling properties without EPCs – no, this is not possible. It's too harsh. It is not going to happen."* (facility manager)

"I don't know really… probably, as it is required, there are some sanctions… maybe there are administrative penalties, or something of this kind…" (building occupant)

"Even at the moment, there are sanctions when the audit is missing. However, no one is imposing them." (EPC issuer)

SI *"There is no control or penalties. It is not enough that they [EPCs] are regarded as simple recommendations. They have to be enforced by the law and, if people fail to comply, punish. As such it has little impact."* (building expert)

In essence, regulation and lack of enforcement are just two sides of the same reason blamed for non-compliance and consequential lack of quality. **Enforcing regulation through means of penalties and sanctions** is therefore seen as one of the primary strategies to realize quality control. The opposite side of quality control is positive reinforcement, such as **rewards for recognition of good work**, which can perhaps be seen as supplementary to enforcement.

IT People suggest that credits for good management in terms of EPB would be a welcome addition to the EPCs, as well as adding incentives.

RO In order to positively motivate users to ask EPCs not only for ruled situations (sales, rent, works reception), fiscal legislation shall be changed in the manner of including some (local and/or national) taxes exemptions for buildings in class A+, A and even B (energy and/or CO_2 equivalent emissions).

All this criticism clearly cannot negate the **past and current efforts made by EPC scheme developers, implementers and other responsible institutions to pursue a certain level of quality control**. As illustrated on the Danish case:

DK The Danish Energy Agency controls a statistically significant sample size (0.25%) of the EPCs issued every year. The quality control mechanism consists of a physical inspection from a qualified EPC company selected through a public tender. The quality inspector then reviews the randomly selected sample size of EPCs and reports to the energy agency, which then decides on the quality of the reviewed EPCs. In 2020 the proportion of correctly controlled energy labels that do not change character (eg C to D) as a result of the physical inspection was 77%, which is close to 2019s 79% of the controlled labels. For energy labeling of new construction, there has been an increase in the proportion of correct energy labeling in 2018. However, the proportion of correct markings is still lower than for existing construction. In 2019, the Danish Energy Agency will therefore also carry out inspections targeted at this type of energy labelling. In connection with the quality control, the Danish Energy Agency has issued 41 statements to companies that have prepared incorrect energy labels, and 10 reprimands to companies that have prepared energy labels with serious or repeated errors and deficiencies. Prosecutions will be published on SparEnergi.dk for one year.

Despite the differences in opinions and suggestions listed above, one point seems to unite all of the featuring reports – **the quest for quality of EPCs requires holistic attention and improvements.** As illustrated by our Hungarian contributors:

HU Pushing EPC issuers to propose better measures is not enough, in the meantime the motivation of end-users and the development of the methodology is also crucial, therefore steps of necessary changes have to be harmonized and planned carefully.

6. COST EFFECTIVENESS

U-CERT aims at incubating **new certification concepts and business models**, which would make the future EPC schemes a cost-effective process and product for all types of users. One of the key assumptions in this regard is that EPCs have a significant **decision-driving potential as a vehicle for clear evidence-based pathways to responsible consumer choices and behaviours**, or specifically, to empower individuals and institutions to make **conscious** informed investments into energy efficiency of buildings. As such, EPCs should have the **capacity to instil trust in the quality of results, including proposed solutions and measures** given by the certificate issuer, as well as **instil trust in the market of building renovation**.

In this respect, the following chapter focuses on some of the user-centred aspects of costs and effects of EPCs. Value and meaningfulness are also closely associated with the notion of **cost-effectiveness**, which we define as **optimal balance of EPC related costs and benefits for all actors involved** that allows EPC schemes to run **effectively and be financially sustainable**. Theoretically speaking, this should be rather straightforward – by demonstrating clearly and unequivocally the positive effect of ownership and use of EPCs, particularly on (potential) financial benefits and other tangible effects (improved comfort and living conditions, safety, higher value of the property etc.). So far practice has shown that this is a challenge. Costs often outweigh the prospect of desirable effects. More often yet, they outweigh the potential benefits. In the following chapter we look at some reasons why, and what could be done to improve the situation.

General outcomes

Suggestions for improvements:

- **Simplify the procedure** and to issue an EPC not as a result of a complete energy audit, but as a market service.
- **Capitalize on existing integrations** of EPCs with other services that offer high added value (e.g. with energy audits).
- **Integrate EPC services with alternative (commercial) products** (e.g. promoted by banks and private businesses).

Cost-benefit balance

Cost-benefit balance tends to dominate most people's rationale on EPCs. **Effectiveness**, focusing on non-monetized effects of EPCs, come secondary and seems to be not enough to have significant impact on people's perception of EPC schemes. Relatively **low demand and high numbers of issuers have driven the price of certification down**, which effectively also **negatively impacts the quality of EPCs**.

BG The quality of energy audits is quite high to match the (national) regulatory requirements but costs are often prohibitive.

ES The price for the issuing of EPC for existing buildings has come to the equivalent of the minimum needed hours to issue it using the simplest tool available. For new buildings, the energy efficiency is determined by the building regulation, not the EPC. Thus, since the EPC is not present in the decision-making process, it is not valued.

SE In Sweden, EPC's are affordable for everyone, however the low actual added value you get out of it as paying client questions the notion of affordability. (Building technology manufacturer)

Several other reports have been made (DK, SI, HU, SE), suggesting that **higher fees** (price for the hour of work) for the EPC issuing service **are likely to improve the quality of EPCs**.

BG *"The price corresponds to the amount of work invested and the end product. But a small increase of the price could result in much better quality. If there is an auditor who is responsible and wants to do high-quality audits, cannot compete, especially at public procurements at lowest price."* (EPC issuer)

In support of such argument, some research participants also pointed out that **people would be prepared to pay more for EPCs if good quality would be guaranteed**.

ES The low fees have an impact on the quality delivered by the technician. The users would pay more to ensure that the certificate represents better the property energy efficiency status. Surprisingly, end users are willing to pay more for a more quality certificate not just to satisfy their bureaucratic needs but to have a proper and accessible record of the energy performance of the property and the measures to improve through time.

SE Even if the absolute cost would be higher the EPCs would be more cost effective and would make more cost-effective suggestions for improvement if the EPC issuer would always need to visit the building. On site, the EPC issuer could identify what improvements can be done and as such come up with tailored and implementation ready suggestions for improvement.

As with any product or service, however, price is not an absolute guarantee of quality. As for the perception of cost and benefit balance, **not everyone has the same view on the price of existing EPCs.** The general rule is that customers (people who order and pay for the EPCs) tend to see them as expensive, while the experts tend to see them as too cheap. As illustrated in the Bulgarian case:

BG General users have no considerable expectations regarding the cost or the process of issuing the EPCs. There are however expectations, that public financing will continue in relation to the renovation programs.

Some of the experts consider the price for issuing EPCs is high for the Bulgarian market which is not used to the service and the purchase power of the occupant is low. In comparison to the EU levels, some experts think it is justified or even low.

This difference in perception is related to the notion of value, which we can simply define as balance between costs, financial benefits and desirable effects. With the question of price, **providers of EPC services** tend to **consider the value of their work,** which is to say, how much they are getting paid. Not surprisingly, highly trained experts expect a correspondingly high pay. **Clients**, on the other hand, **consider the value of the product and service they get for their money**.

BG *"Bulgaria offers excellent quality of the audits. Of course, not everybody can afford that. This is why individual users are always considered a 'special category'. We have been thinking for a long time for simplifying the audits for them, simplifying the smart readiness indicators in the future, if you want. On the other hand, there is a high level of expertise needed when it concerns auditing of a building in the tertiary sector or a public building. The quality of the audit defines its cost. There is a possibility to lower the quality for the individual homeowners."* (public authority representative)

EE It is difficult to develop normalization (improvement) because according to the general understanding, EPCs must remain cheap, robust, simple and reliable. Complicated calculations and assessment do not fit to such a frame.

ES The certificate in residential buildings is not being done with the necessary professionalism, because it is very cheap and the result is not reliable because the technicians do not have time to deliver a quality report.

The construction sector undervalued the EPC in the beginning, and now the value of it is very low. The only decision criteria when facing the EPC is price, the technical expertise or details means very little. Therefore, the competitiveness is stablished purely on price, hence the extremely low prices paid by EPCs, and the little time dedicated by issuers.

SE In Sweden, EPC issuers often do not visit the site due to cost reasons. As an unwanted result, the suggestions for improvement are questionable and difficult for building owners to implement because they are too generic and not tailored to the actual building.

SI *"Looking at the fact, that EPCs are products of expert work, the price is too low, which shows on quality."* (public authority representative)

These two rather separate lines of reasoning create the situation that can be described in terms of a "vicious circle", which seems difficult to break.

EPC issuers	**EPC customers**
Price of work is low. No motivation for in-depth work, liability to superficiality.	Price of EPCs (cost) is perceived as high, because the value of EPC products and services is perceived as low and/or unobvious.
Value of EPC issuing hour is low for the issuers as the demand is relatively low and/or the market is saturated with EPC issuers.	Value of EPCs is low for a variety of reasons: • **Poor public perceptions.** EPCs have been poorly promoted, in some cases even negatively • **Seen as costly.** Many believe measures proposed on the basis of the existing EPCs are not feasible. • **EPCs are generalized.** Many complained

	measures are not tailored to the household needs and expectations. • **Lack of understanding.** Many have issues understanding the existing EPCs. • **Lack of utilities.** People do not find EPCs useful. They lack relevant "real-life" and "real-time" data and information that would enable meaningful use (e.g. informed energy management of the property). • **Lack of contextualization.** the EPCs are not meaningfully connected to related fields – professional services for improvement of IEQ, health and safety, energy efficiency, …
Quality control over both work of EPC issuers and the methodology is poor. This results in poor quality products (EPCs) and devalues the work of EPC issuers, which demotivates experts from maintaining high standards of work.	Quality control is poor. Compromised quality of EPC products and services undermines the value for the user.
In addition to the low hourly wage, the existing format of both the EPCs and the certification methodology are a barrier for EPCs to reach the positive potentials implied in the concept.	Financial savings (benefits) and positive effects following from existing EPCs are not convincing enough to justify the cost of EPCs to the people.
Existing public financial support (subsidies, grants, tax reliefs) seems to have little effect on the market.	Existing public financial support (subsidies, grants, tax reliefs) seems to have little effect on decision making.

Market impact

The existing EPCs therefore have limited impact on the market of construction and renovation and certainly do not sustain the market for EPCs as such. **The existing market for EPCs only exists because it is part of the policy**, which is closely related to the notion of EPCs as "administrative necessities", which is discussed in further detail in the following chapter *Wide base support*. With regard to their possible impact future EPCs could have on the market, confidence is limited.

> **BG** *"Probably, for new buildings, if the certificate demonstrates a higher energy class, that would make some difference on the market, but else… it's hard to say."* (building designer)

However, there is a hint of possible change. Given the right qualities, and especially in the context of digitalization and improvement of the next generation EPCs, associated with innovative (digitalized) services, **EPCs as such could in fact function as a factor in market development**.

ES EPC could have more weight on the financial sector, maybe linking the mortgages to the efficiency of the building.

FR *"Can we use this document to negotiate our bill with our electricity supplier?"*

EPCs will have limited impact on market development as long they remain being seen as offering poor value. Some research participants have suggested that ambitious public support policies based on serious public investment in the building sector have the prospect of creating favourable market conditions for the establishment of a functional market for EPC products and services. However, as we have already managed to show by now, this will require significant work on improving the EPC concept.

Balance of market proactivity and state regulation

Finding the right **balance between bottom-up market activity and top-down state regulation** is key. Here opinions are often contrasting. Some research participants were convinced that there would be no major impact through regulation and that bottom-up market activity is crucial. Others have claimed that there are no real conditions for market activity (including regulation of externalized costs of pollution, abuse of workforce and other aspect, absence of which effectively keeps the price of consumer energy and products low) and that consistent top-down interventions, especially in the form of public support schemes, are absolutely key in the development of stable, effective and long-functioning market.

Importantly, they are largely **associated with** various **"support programmes",** such as subsidies, grants and other publicly funded actions **aimed at stimulating building renovation and sustainable (nZE) construction**. These support programmes will reportedly stay one of the main drivers for demand of EPCs as they are seen as one of the necessary steps on the way to a viable financial plan.

U-CERT research participants, depending on their understanding (background), expressed different opinions on who should be responsible to stimulate market demand. Two options were most prominently pointed out:

- by state intervention (law enforcement, support policies, incentives and penalties), or
- by market promotion.

Often the **state is considered to be a regulatory body**, meaning it is not the one responsible to promote EPCs as such. In this case **the market for EPCs should be promoted and created by the providers of EPC products and services themselves**, using communication and promotion campaigns to convey the message of benefits, and/or offer integrated additional services. In practice this is difficult to expect since businesses are generally too fragmented and individualized in pursuit of their interests and business success. On the other hand, **state is also** the biggest proponent and – in many of the U-CERT case studies – **the ultimate beneficiary of the EPC scheme.** As pointed out with regard to EPCs being a tool for MS to "report" and demonstrate their compliance with existing EU regulation, this means it is in their best interest to actively pursue a high uptake of EPCs.

In search of a "good deal"

It does not come as a surprise that **prospects of financial savings present a key motivational factor**. As reported by the Bulgarian contributors, **the notion of "making a good deal"** with regard to investment into energy efficiency of buildings tends to be recognized as a **key driving factor for the uptake of EPC products and services.** Undoubtedly finances are one of the main reference points for evaluating decisions.

> **SI** *"We all understand EUR. If we would display things in EUR the impact would increase."* (building manger)

Although important and arguably most obvious, monetizable value is only one way how we – individuals, communities or simply people – are making sense the world around us. Based on U-CERT research we defined the following potential lines of reasoning associated with EPCs:

- EPCs as the first step towards understanding how investments in energy efficiency improve the **value of the property.**
- EPCs as the first step towards understanding how investments in energy efficiency improve the **quality of living in the property.**
- EPCs as a reference point indicating **quality of housing**.
- EPCs as a **tool for informed energy management of housing**.

As indicated earlier in the report, much of these aspects are theoretically implied in the EPC concept but the practical (factual) value of existing EPCs remains limited. As discussed in the previous chapter, one of the first steps that could be done to tackle the issue constructively and without a big change of the system or content of the existing EPC scheme is to **improve quality control**. Another option is to make EPCs more useful and valuable, for example by **reducing the amount of necessary administrative requirements or streamlining the procedures** that form part of the process of issuing the EPC. This would help save time and raise the value of EPC issuer's work. Some of these aspects, related with EPCs as "administrative necessity" will be discussed in further detail in the following chapter. Here we will now look at potentials for new business models.

New business models

The associative **proximity of EPCs and energy audits** is telling. A large number of references regarding cost-effectiveness of EPCs were based on **assumptions for the potential for energy and financial savings.** These calculations are typically done as part of the energy audit, predominantly for big institutions and businesses, and are generally deemed as necessary and cost-effective to identify and quantify efficiency investments. In a way this tells us that the two concepts are hardly divisible. In other words, **to render EPCs more cost-effective, perhaps it is necessary to realize that EPC products and services alone, as a goal in themselves, are not enough**. They need to be integrated with the broader context and also be presented as such. As illustrated by the Bulgarian contributors:

> **BG** The audit is perceived as a necessary first step for a renovation project and it is expected that the investor would bear the cost whatever it is – especially as it is most often covered by subsidies. The benefits of building certification are perceived as not existent on the Bulgarian market, compared to other countries. One informant insists

that in “other countries”, EPCs are a precondition to receive grants and also a driving force on the market, but in Bulgaria they have little or no visibility at all.

RO The Romanian informant suggested that EPC maybe should have also taken into account other important building features like seismic behavior and fire protection. However, these aspects will certainly increase the cost and complicate too much the EPC issuing procedure, involving other types of experts.

This relates to the prospect of **creating new business models** that would integrate EPCs as part of their service. As reported by several U-CERT contributors, this is one of the potential steps towards creating added value for end-users. Hungarian contributors highlighted the opinion of some of their research participants, arguing that the **EPC could (and should) be a starting point for planning (deep) renovation projects.**

ES Document that determines the energy consumption of a specific property through its construction materials, gas emissions… to provide a more pragmatic vision of which energy renovation actions should be performed.

HU The aim is to use EPC’s results as an input for the design or the implementation of a renovation project. One-stop-shop business models are best practices in some foreign countries in the field of building renovation, so this can be a solution to bring closer home/building owners and service/product suppliers in Hungary too.

Quantities should appear in connection with the thermal development of building structures, which will facilitate the request for quotation. It should also be explained in the EPC that this data can be used to start bidding, moreover it could also be used to verify the bidder. Thus, the energy performance certification would have a larger role in the market and its application would become more widespread due to its usefulness, therefore its value would be experienced by the end users.

Having **EPCs as roadmaps to building renovation** has shown to be a recurring suggestion in virtually all of the U-CERT case studies. This also implies use of EPCs as **reference point for monitoring efficacy of the implemented measures** for improvement of energy efficiency of buildings/properties.

DK Many people do not see the relationship between the EPC and the price of their property.

ES It is necessary to incorporate indicators related to comfort and investment costs.

It is important to stress, however, that this idea relates to the point regarding **overlap between different concepts.** In this specific case the service of energy audits, which substantiates the need to concisely define borders and purpose of these individual concepts.

EE Implementing standard user profiles for measured EPCs would likely mean the modelling of the building for sufficient accuracy, driving up the cost. Increased cost and level of detail would start to take the scope of an energy audit rather than an EPC already.

The other difficulty is again the **quality of the measures proposed in the EPC** (in the broadest sense). As pointed out earlier, qualities of existing EPCs are not persuading.

FR *"We can see that it is expensive, that the return on investment is not quick and that the gain in savings is not very important. So, we wonder why they are making the recommendation. Without further explanation I do not see the point of doing the work."* (general user)

Another important way of understanding **EPCs** is that they **should be seen as an integral process of building maintenance.** Bulgarian contributors point out that such understanding would stimulate demand for a variety of professional services related to building maintenance and **improvement of energy efficiency, IEQ, etc., a niche which they see as currently largely vacant.**

BG Despite some positive developments in the past few years, there are few competent functioning property management companies which would offer consultancy services or proactively inform the homeowners about energy efficiency related topics.

HU Hungarian contributors also pointed out IEQ as an important factor, and reported that inclusion of comfort parameters into the EPC is already discussed in relation to the process of updating the Hungarian legislation regarding EPBD. There are different opinions of inclusion of comfort parameters into EPCs. The indoor temperature and the air quality are typically user-dependent factors, therefore may be not appropriate to present them in the EPC, because in this case the user will be rated and not the building. This can cause confusion, when selling a building. However, when the EPC is made before and after a renovation project, or for own purpose, it would be useful to present not only the energy characteristics but comfort as well, because the EPC issuer can give recommendations on energy use and comfort aspects, respectively.

Such integration and development of EPC schemes would clearly also present a significant challenge.

BG *"It is another question if there are national stimuli as it is in Germany, as far as I know. There is easier access for to subsidies for those who have certificates, and even more – the better class you achieve, the more money you get. In Bulgaria it is not the case – whatever you do, you get 100%. At the end, people are motivated by the idea to pay less. Even the comfort doesn't play such a role. If you could save from ventilation, you tell yourself – is it that important really, I could always open the windows… Mould, condensation… not many people are impressed with that…"* (building designer, NGO chair)

EE IEQ assessment of some sort would be relevant. However, it is hard to implement in practice. III category could be assessed in most cases with knowledge about the technical systems within the building. These are generally anyhow already entered in relevant building databases and this data could be pulled for use/show in EPCs

Despite the likely difficulties, including such reliable and relatable indicators would provide users with what several of our contributors labelled as the **need for transparency in decision making process**, which is an important base for development of new business models targeting a variety of renovation and retrofitting interventions. In this regard, some informants also pointed out that **EPCs are**

(theoretically) a good tool for following the effectiveness of individual (or overhauling) **renovation measures**. However, they noted that people do not necessarily know that or see this as useful. Research, on the other hand, offers proof that there is an obvious correlation between the EPC class and household's costs.

DK The Danish Energy Agency asked Copenhagen Economics to investigate whether there is a connection between a home's EPC energy label and operational energy costs. The study, part of the Better Housing initiative, shows that energy renovations gives rise to financial savings through lower energy bills. Calculation examples show that these savings can be considerable.

EPCs as benchmarks for quality housing

Many research participants pointed out that **better EPC label/class is supposed to function as a benchmark for quality of housing**, adding value to properties with good energy performance and motivating owners with lower labels to invest in improvement of energy efficiency with the same goal – to increase property value.

BG *"The term itself sounds very attractive. I suppose that everybody would like to acquire such a certificate demonstrating higher efficiency, as it would show the building is in higher level, it will command a higher price."* (building occupant)

Although the idea of **EPCs as a benchmark reference for real-estate trade** (buying and selling property) is declaratively one of the strongest points regarding attractiveness and desirability of EPCs, **practice shows that this is not factually the case**, especially in the case of individual property owners. A Hungarian housing corporation representative claims that people selling properties and, even more importantly, not even people buying them, "care" about EPCs at all, which is to say they do not consider them as significant in any way. To illustrate, the following example was provided:

HU They are just now selling an apartment, and there were 50 people who were interested in the property, 9 people saw it and 3 gave quotation for buying it, but none of them asked the EPC. This is because lay people understand only a little part of the current EPC, so it can be concluded that there is a lot to do to increase user-friendliness of EPCs. EPC consists of a lot of important data, but not in a way lay people understand.

There are exceptions - individuals, businesses and institutions that are well informed and aware due to their knowledge background, day-to-day life interests and exposure to relevant EPC related information at school, work, or interaction with family & friends. These, however, seem to represent a minority**.** Reports from Bulgaria, Estonia, Slovenia and Spain show that **in the process of buying a property,** which is considered as the period in which EPCs should most evidently demonstrate their value as a reference point for evaluating the quality of housing, most **people do not consider existing EPCs as a relevant reference point**.

BG None of the Bulgarian focus group participants have asked for an EPC when buying/renting a property.

BG *"The idea that the certificates would be needed to demonstrate the energy characteristics in the process of selling and buying of housing units was not implemented and it soon become obvious that there will be no control over that."* (energy auditor)

EE The EPC category shown on the cover is often perceived as just an abstract figure/letter for general end-user. In factual sale/rent transactions, it is very common to ask the previous owner for actual energy bills from past year(s).

ES On rental and sale websites, the certificate is almost always pending, the market is avoiding EPCs.

SI *"I have not met many people, who would ask 'what is the EPC like?'. It was much the opposite – I arranged for a real-estate to be sold, we paid the advance, now before we sign the contract, it has to have the EPC… yes, you know what… send it to that guy, so that it ads it to the papers. Normally he does not even look at it, the buyer. That is to say, he first breaks a deal, and then he has to* [make the EPC]*, to make it all legal. Otherwise some claim the contract does not legally comply."* (EPC issuer who is also a real-estate agent)

As an interesting side note, reports from Slovenia and Spain indicate that structure of housing market can also have an impact on both the uptake of EPC products and services as well as their general perception. In these two countries, percentage of rental housing is very low in comparison to private ownership. In this regard, Spanish contributors suggest, **energy efficiency of housing could have more significance if people would be changing their homes more often**.

ES The reduced impact of EPC in Spain is also attributed to the little culture of rental of houses. If people rented more often, that change of houses every 5-7 years would cause that energy factors had greater presence in the decision-making process.

Access to funding

Disinterest and/or the perception of poor value, which many people have in relation to the existing EPCs, is often blamed on the **lack of awareness and understanding (knowledge)**, which implies that **educational activities and services that provided (targeted) promotion**. It is also often related to the already outlined **lack of practical value**, and the general perception of EPCs as being simply an **administrative necessity**. Before looking at these topics, much of which are discussed in the following chapter, there is another aspect worth highlighting in relation to cost effectiveness **– access to funding and effective systematic financial support**. Research participants on both individual (homeowner) and institutional levels often labelled access to funding for implementation of energy efficiency measures as the **main driver of demand for EPC products and services**.

BG *"Of course, access to subsidies is a very serious reason. Not everybody could afford to apply measures as they require a lot of money. If people are supported in some way, they would be motivated to give part of the money. Everybody likes to receive support for something like this."* (building occupant)

HU If tax, contribution and/or fee discounts would be available when their property achieves an energy performance requirement, that would definitely motivate end-users to implement renovation.

RO The best promotion of the EPCs is through the public or local investment programs for renovation.

At the moment it seems that access is not optimal or effective. As a result, EPCs are also **not recognized as a significant reference point in financial management** of properties.

BG There is no practice to base financial instruments on EPCs.

BG There is no clear understanding for the existing option to receive tax reliefs in case of acquiring an EPC for a specific energy class.

ES The energy renovation measures are not linked to the energy class. Is it impossible to see the impact of those measures both from the energy consumption and economic point of view.

Expectations are that integrating EPCs into established funding practices will affect the demand for EPC services positively. As reported by the Bulgarian contributors, established practices of international investors, who require EPCs as part of their funding process, are identified as leading motivation to order EPCs.

BG *"There are generally two types of clients: those who need to prepare a technical passport for a new building, and those who participate in different European programmes… they want to see how many points they will get for the programme. At the moment, there are no other drivers."* (energy auditor)

It has to be pointed out, however, that **not everyone sees EU financial interventions as a necessarily positive factor** since they require a significant amount of paperwork and attention.

BG *"Yes, V. (a famous journalist – Ed.) was approved for a bank credit – however not because his house was a passive house, but just because he was V. The programmes for replacing building components run by XYZ bank – our clients did not want to have anything in common with it. How many cases we had where a 'European programme' was actually a burden for the investor rather than of any help – nobody wants to take EU money again. What I mean is that when we design a European programme we have to design it in a way that it is acceptable for the average citizen, and not only for the big players."* (building designer, architect)

On a similar note, **lack of consistency in public policy on access to public funding for renovation projects** was also reported as problematic. Several research participants commented that as politics and their priorities change, so does the model of public funding, which includes various forms of financial support to the market of housing renovation – grants, subsidies, tax reliefs, etc. The resulting lack of consistency negatively impacts the market for renovation, which can therefore not be properly established. As explained in the case of Bulgaria, not knowing what the next public funding scheme

would look like and when it would come in force prevents EPC issuers and consultants to invest in services that would complement and extend the existing EPC schemes.

BG The state policies regarding building renovation are unpredictable, varying from significant public investments with 100% grant rate to zero interest for several years. The is considered a main obstacle for market formation.

Perhaps not surprisingly, **calls have been reported for EPCs to be 100% financed by the state.** As informants pointed out, this would resolve many of the issues that are now challenging the efficacy and quality of EPC schemes.

HU Some of the users mentioned the state should finance EPCs for private persons.

ES The state should finance the EPCs. As some informants commented, reflecting on the notion of EPCs as a mere administrative necessity, the one who benefits most from the scheme should pay for it.

Clearly not everyone agrees that EPCs should be financed by the state. This debate is complex and closely related to aspects related to cost-efficiency, such as value, meaningfulness, legislation etc., much of which we will discuss in further detail in the following chapter on *Wide base support*. At this point, taking into account aspects outlined above, it will suffice to conclude that **access to funding and consistency of (public) policies certainly does play a central role with regard to general perception of EPCs and ultimately its cost-efficiency**.

7. WIDE BASE SUPPORT

Success of EPCs in large part depends on a wide base support, meaning a wide coalition of interest groups and stakeholders supporting and potentially co-creating networks and systems necessary for the existence of EPC schemes. Creating inclusive solutions that gain strong support for EPC schemes across EU is one of the key aims of U-CERT. In this chapter attention is given to broad topical areas of value, legislation, education and promotion. We focus mostly on aspects of wide base support that relate to EPCs as a useful, valuable and meaningful tool with a positive real-life impact. Especially value and meaningfulness prove to be essential for successful future development of the EPC concept of the future. This chapter stresses their importance for increasing demand and positive uptake of future EPC products and services.

U-CERT aspires making future EPCs a desirable tool, which people will use to manage and maintain their property to achieve optimal level of energy efficiency. Although the particular purpose and quality (type) of information provided and/or expected from the user vary significantly, depending on users' background knowledge and interest, we conclude that for realisation of U-CERT project goals, future EPCs need to provide information and utilities that people recognize as valuable and meaningful. Such EPCs will have the capacity to indirectly drive development of renovation and construction market to meet the sustainability goals set on the national and EU levels. Ideally, they will also influence the real-estate market at large, prompting people to demand high-quality housing, which includes aspects such as high levels of energy efficiency, IEQ, comfort etc.

For effective and successful realization of the U-CERT outcomes, transfer of theory to practice is needed. Future EPCs have to present all types of users with clear, unambiguous, and meaningful information on the building's/property's (measured) energy performance, IEQ, and related impacts of the built environment on health and wellbeing of people. Future EPCs also have to **make energy more intuitive** and **influence behaviour** of building users, indicating aspects which are largely being neglected or not represented clearly in the existing EPC schemes, such as **health, safety, convenience, well-being, comfort etc.**

General outcomes

Challenges

Research participants identified the following gaps in relation to the topic of wide base support for EPC products and services:

- **Ineffective public policies.** Public policies often fail to drive demand for EPC services, making it hard for the market to properly develop.
- **Lack of motivation & interest on the side of experts in construction and renovation.** Architects and designers are reportedly often not interested and/or motivated to integrate energy efficiency as a priority in their work.
- **Lack of reliable information.** Not enough information is reaching the end users and investors to drive/create demand for specialized (EPC related) services. In part this is due to passive market players – brokers, sellers, experts in construction and renovation – who fail to promote such services. Similarly, there is no sufficient information from the side of public authorities regarding the need and benefits to have or consult an EPC.

- **Fragmentation of construction and renovation sector.** The construction and renovation sector is fragmented. Individual suppliers of products and/or services are concentrated on their own business success and not on development of working concepts or pursuing collective goals.
- **Lack of financial incentives.** Current support from banks and other financial institutions for implementation of EPC goals is insufficient, even for financial products based on the European programmes or policies.

Potentials

Here are some potential concrete actions to move towards expanding and consolidating support for EPCs:

- **Decrease costs & simplify the issuing process**
  - Provide only the key information.
  - Integrate the process with related procedures and services
- **Build knowledge and awareness**
  - Educate users; enable and streamline access to reliable information and educational contents.
  - Improve training of EPC issuers.
- **Improve quality and contents**
  - Modifying the EPC schemes so that they deliver better value for the users.
  - Summarizing existing status and proposed measures in a way that is easy to understand and can be used for taking next steps in the implementation of the renovation.
- **Promote and campaign!**
  - Set up a promotion and/or marketing strategy.
  - Launch national (marketing and promotional) campaigns to demonstrate the importance of EPC.
  - Engage mainstream media in the campaign. The Hungarian contributors suggested that campaigns should be implemented quarterly on TV and radio channels. The aim would be to raise people's awareness on the energy efficiency of their buildings, and for which the EPC could be the tool.
- **Digitalization and automation** are considered to be an important part of the EPC future. Everything that can be digitized and automated should be done. Use of resources should be shifted from the making of the EPCs to consultancy (with regards to securing an optimal output with regards to energy efficiency measures).
- **Provide exclusive benefits.** Based on as reference points for (successful) investments in energy efficiency, owners who invest in renovation of their property should be given exclusive benefits, such as tax cuts or comparable.

Purpose, meaningfulness, value

Topics covered in past chapters – user-friendliness, quality, cost-effectiveness etc. – are closely related to the notions of **purpose, meaningfulness and value**. With respect to U-CERT project aims and goals, understanding them is **essential for ensuring efficacy, usability and outreach of the project outcomes**.

Starting with purpose – interpretations of the purpose(s) of EPCs, some presented in introduction to this report, are very diverse and largely reflect the individual user, their knowledge background, their specific interests, and even specific contexts of their issuing. In its most general sense, **the long-term purpose of EPC schemes is to support efforts for decreasing energy use and indirectly the transition to sustainable building stock.** To achieve this, it has to have a certain level of agency, meaning it (directly or indirectly) influences people's actions and behaviors. This includes different types of EPC users on the one side and the entire chain of EPC related stakeholder profiles on the other. In order to achieve this, **EPCs should ideally present some sort of value to all of the users and stakeholders.**

In earlier chapters we already referred to the notion of value various times. In the chapter *Cost effectiveness*, we established that the **value of existing EPCs** can be provisionally determined by looking at users' experiences and perception on the balance between costs, financial benefits, and desirable effects associated with the final result. In earlier chapters on *Quality and User-friendliness* the notion of value is closely associated with that of usefulness. Both definition relate to the widely promoted and accepted idea, that **EPCs should be useful and used by people**.

BG There is no doubt that EPCs must be recognizable and used by building owners and residents.

IT Some experts claim that the existing EPCs are overly technical and put energy performance before the user and purpose of use.

SI *"The purpose of this* [the EPC scheme] *is, from the very beginning, to bring energy closer to people, because it is abstract. This is the key issue, to this day. We're talking about energy yet no one knows what a kWh or a MWh is. Nobody has an idea how much that costs, because energy is simply intangible. The purpose, therefore, is to bring energy closer to people, to raise awareness and, as a result, decrease energy use. Political goals might be different, but that is irrelevant."* (building professional)

NL The purpose of EPCs is to let people know their energy use so that they can bring additional energy saving improvement to their house. Also, there is some legislation because the climate law that you shall have an energy level C or B by 2020.

In simple terms, **useful EPCs are likely to be perceived as valuable EPCs**. For example, making future EPCs a tool for monitoring and managing both energy consumption as well as IEQ and comfort is expected to render them more valuable in comparison to the existing EPCs.

BG *"It would be much more useful if, within the certificate itself or within another instruments, users receive more simplified information, regarding the energy parameters, regarding the comfort, regarding the health and well-being."* (EPC issuer)

SI *"They should serve us so, that we in fact learn to do it right, or rather, to use the building correctly regarding its performances. /…/ In principle we should, on the basis of the EPCs,*

that actually don't have such function… is this, that people know in what kind of a building they are in, and secondly, that they know how to act accordingly." (public investor)

In terms of usefulness, we have already established that existing EPCs do not have much to offer. Although promising in theory, in practice EPCs are rarely used. Given the lack of obvious (and factual) benefits and limited effects of existing EPCs it should come as no surprise that EPCs are largely perceived **as an "administrative necessity"** – a necessary step on the windy bureaucratic pathway towards a desired goal. As our Hungarian contributors explains, most people consider EPC as a mandatory administrative document with little practical value and therefore any price is "expensive" for them.

HU *"The EPC is a mandatory administrative task. The average user can interpret at most the ratings shown on the cover page, at a comparison level."* (EPC expert)

DK Most building owners and users regard the EPC report as a compulsory document for selling and renting a building or apartment. Since the current EPC is relatively cheap, most people do not care about it.

ES Currently, the citizen understands EPC as a mere "additional paper" in the process of leasing or selling a building property. Users see the EPC as a document designed to comply with some bureaucratic procedures.

ES There are some EPCs with very poor technical quality. Also, some citizens perceive the EPC as just "another paper", not giving it the value, it deserves. This causes EPCs to be poorly valued in terms of cost-effectiveness. The different software tools available should be more stable and homogeneous, with less discrepancies and errors between them. The default values should be removed since they allow to issue EPCs with too little input data. The public administration should advertise more the importance of EPCs.

ES Existing EPC scheme generally serves a self-fulfilling function of an administrative necessity for managers of institutional real estate or for private owners when they were buying a property.

IT *"The intention to create an energy registry of buildings was right and useful for the purpose of seeking an efficient and energetic improvement of the existing building stock, but it was transformed into another bureaucratic quibble necessary for ownership transfers and not considered as an energy assessment tool."* (EPC expert)

The theoretical potential of EPCs has obviously not materialized, or rather, it has but to a limited degree. Reasons for that are varied, yet one of the more obvious reasons, already discussed in past chapters, is that the existing EPCs seem to have been created for experts. Research participants across the scope described them **as largely uncomprehensive and technical.** What is more, a significant number of the very people who created or enable the existing EPC schemes and system **regard them as a tool in service of the expertise**.

HU One of our informant said: *"The EPC is suitable for comparison (e.g. "A" is better than "B" energy class) for end-users even in the existing format and content. The aspects of professionals should be given priority when developing the certification scheme."*

While other experts think: *"The existing format and content of the energy performance certification is understandable only for building professionals, but for lay people the most of it is impossible to understand."*

SI *"The practical value is for project developers, ok, not for the users. This is the purpose. /…/ Who makes buildings? It is not the users. That's my perspective."* (EPC scheme and guideline developer)

The quote from the Hungarian case indicates how **unclear and varied understanding of EPCs purpose creates confusion and space for conflicting beliefs and opinions,** which ultimately undermine the impact and value of EPCs. Such **gap between the declarative and factual value proposition and purpose of EPCs seem to be present in lesser and larger extent across the EU**. Another aspect of this gap was reported from Estonia, where the non-residential buildings are reportedly getting a "disproportionate" amount of attention regarding quality of work, which is again contrary to the idea of EPCs in service of the people.

EE There are some concerns that a disproportionate amount of effort is put into development of EPCs of non-residential buildings, while a majority of EPCs are provided for residential buildings.

With regard to the purpose of U-CERT's objectives, divergent opinions regarding the purpose of EPCs has major implications. For a project to effectively address an issue, certain bottom-line assumptions have to hold true. **In case of U-CERT, the question, such as what is the purpose of EPCs and who does it serve, is absolutely key.** Are existing EPCs really a tool for the widest scope of potential users, and if not, should they evolve to become that? The answer for U-CERT is clear – yes! As solutions for future development of the concept are plenty, as we have hopefully proven by now, perhaps **the biggest challenge** of the project is therefore not to define them, but to persuade policy implementors and experts working in the field of construction sector to agree, and more, to act accordingly and develop EPCs from a tool in service of expertise to a tool in service of the people.

BG The EPCs of the building stock presents basic data for experts and policy makers. (public authority).

SI *"The user does not concern me. What concerns me is what the project developers have to learn, so that they will get to these indicators."* (EPC scheme and guideline developer)

Disinterest, ignorance, and apathy

To reach U-CERT goals, EPCs will have to be perceived as useful and meaningful. With regard to the existing EPCs being seen as administrative necessity, many informants – both from the side of experts and general users – postulate that **lack of awareness** is to blame. In part this is certainly true. However, before we discuss how to address this, we have to recognize another point of view. Some experienced EPC issuers and other experts that work with people frequently state that **people are predominantly pragmatical and that they tend to search for simple solutions that require less effort (time) and finances**.

BG *"People are only interested if it is legally required, they are not interested in energy efficiency in general."* (experienced building certifier)

BG "*If you take out the municipal buildings, the private investors who possess building for public use are looking for the services only if they are required. I am absolutely not sure if they understand what they receive as a service. I have an example from yesterday – a building manager of a public building of 4-5000 sq. m. was looking at the documentation and the only thing he cared about was if the audit is still valid or he has to do a new one. He never thought about the measures, if they are implemented or anything else at all."* (building designers - architects)

FR *"The only influence is that EPC is a paper sheet that it's required. I have my tenant's experience; I provided her the EPC. And if I call her, she won't even know what the document was. She must have it in a folder but she didn't even read it."* (EPC issuer)

While **lack of demand for EPCs can be interpreted as a sort of pragmatic response to the fact that EPCs present users with poor value**, we need to recognize **disinterest, ignorance, and apathy** of both individuals and institutions towards EPCs and its associative field as an important factor(s) in pursuit of U-CERT goals.

BG *"Let's be honest – people do not care about EPCs. The lower the standard, the less people thing about energy management and environmental issues."* (facility manager)

HU People only have EPC made in mandatory cases, such as real estate selling or renting, or for an energy tender. If users are not motivated and do not have requirements, this can reduce the quality of EPC: engineers always satisfy demands of clients, so EPC issuers will do the calculation and propose measures, but if the client is not interested in the result and do not have demands on the EPC, this can have a negative effect on the work.

Examples above imply **the need for legislative enforcement of EPCs,** which we discuss in the following section of this chapter. Here we focus more on the opinion voiced by several research participants, saying that **people and society in general have little interest in environmental issues** and that energy efficiency (as a concept) simply **does not have the capacity to be the leading force behind the decision-making process**. A related aspect, expressed mostly by experts, is **a general lack of consciousness for building maintenance** among the general population, a view often referred to as due diligence of a good manager.

BG For many homeowners in multifamily buildings in Bulgaria, the maintenance of the building is not their responsibly but rather a function of the state or the municipality.

It seems that on the one hand people claim they care about the environment, find ideas of energy efficiency important and have a positive attitude towards the purpose of EPCs in this context. Many also recognize the potential effects and benefits of measures proposed by EPCs. On the other hand, demand for EPC services is low and **people reportedly actively avoid responsibilities and actions related to investments and improvements of their property.** All this might seem counterintuitive, yet such observations are nothing new. Essentially, we are observing **a form of value-action gap** – a discrepancy between attitudes and beliefs on the one hand and actions and behaviors on the other. This

phenomenon has been extensively recorded and scrutinized in the broad area of environmentalism, where individuals were observed to act in clear contradiction to the expressed "progressive" environmental values which they expressed. This puts arguments, such as one voiced by a research participant from Denmark, into perspective.

> **DK** Non-professionals should probably have more focus on CO_2 than energy for their engagement. Climate could be more motivating than saving a little energy.

It is unclear if such opinions have much substance. An illustration that helps us put people's perception of energy efficiency and limited practical use of existing EPCs in scale is the following. In one of the tasks included in the U-CERT focus group activity participants were asked to order various qualities ascribed to housing by the order of their personal preference and importance from the least to the most important. These included:

- Energy efficiency
- Accessibility of water and waste management services
- Physical characteristics (interior design, distribution of space etc.)
- Ownership (ownership freedoms, rights and privileges; property as an investment)
- Tenancy (freedom of mobility, less responsibilities regarding building maintenance etc.)
- Location (proximity to work/office, friends, family, etc.)
- The surroundings (proximity to services, such as shops, schools, transportation, parks etc.)
- Financial accessibility
- Security
- Size
- Socio-cultural context (integration in local community)
- Other

In majority of cases participants **listed energy efficiency relatively low on their priority list**, typically following characteristics such as arrangement of space, the character of the surrounding area, financial affordability, and security.

> **BG** People do not really care about the performance or consumption and what are the long-term impacts on the environment and climate – it is most often the legal obligation that drives them to EPCs.

> **ES** The decision to purchase a building occurs less often than the purchase of equipment, and what is most valued is the area and location and secondly the facilities. Also in the decision to buy equipment, reliability and economy are more important than energy efficiency.

These observations again point towards the discrepancy of people's declared values and the pragmatical logic observed in people's actions and behaviours.

> **DK** Non-professionals (single family houses) – if it is used, it is solely to negotiate the price. Not often used for energy efficiency activities.

Coming back to the main point, focusing on **making EPCs meaningful for people** certainly is a step in the right direction. The potential for impact in **the context of values and purpose related to**

environmentally responsibility is certainly not to be completely disregarded. This, however, is only a part of the solution. The contrasting opinions shared by different research participants – ones arguing that people do not actually care much about climate and energy efficiency, others that this is a consequence of bad policies or other external factors – indicate deep and complex issues which are unlikely to be resolved in a simple way. If we want people to find EPCs **meaningful**, they have to have **a recognisable function or logic** within their lives. When such, people are likely to find them valuable, and what is ultimately most important, are more likely to use them in practice. **Realisation of the declared purpose in practice is what grants legitimacy to claims of success, effectiveness, and quality of EPC schemes.**

While one can make an argument that much of what was said above refers to individual homeowners, it is important to emphasize that **public institutions are also prone to such pragmatism**.

> **SI** *"So for example, at the very beginning there was a public call and we got do quite some EPCs for public buildings, such as health centres and such… relatively big buildings. And once we made the certificates we said – we'd come and present you, right, where you are at* [in terms of energy efficiency] *and so on… but they'd be like – no no, you just send them over and… they told us at the ministry that we need it. That means they don't see the added value in it. The added value is just to fulfil some administrative necessity."* (EPC issuer)

> **SI** *"Our EPC… the story goes like so. We have had one made because we had to. We've put it up at the reception, on a visible spot, and here the story ends. Sincerely speaking. /…/ It has no functional value."* (building manager for one of the faculties at the University of Ljubljana)

As pointed out in the chapter on *Cost effectiveness*, several research participants pointed out that demand for EPCs, be from individuals or institutions, is related to two main factors – funding possibilities, topic outlined in the previous chapter, and legislative framework. These and other related aspects are discussed in the following sections of the chapter.

Coalition of stakeholders

A big topic with respect to support for EPCs turned out to be the **difficulties regarding coordination, collaboration and especially unification of different stakeholders**. Reports of strong opposition to EPC schemes by various stakeholder groups came from virtually all of the U-CERT case studies. Comments were made indicating that **decisions regarding EPC schemes are being made in "closed circles",** involving only a handful of people who often **pursue partial interests** and are unwilling to collaborate constructively with the wider community of experts and representatives of the interested public.

> **BG** *"I think the decisions (for improvement of the EPC) are taken at political level and we as a professional community do not have a significant influence."* (experienced building certifier)

In this regard, **political and economic interests have been pointed out as a significant factor (barrier)** with regard to the introduction of instruments to stimulate energy efficiency in buildings. As an example, research participants from Bulgaria and Slovenia have associated efforts to impose the EPC as an obligatory instrument with **the notion of "political will".** Reportedly, strong political will is needed

for changes to take place. This, however, is lacking as such actions are expected to not be favorably accepted by the voters.

BG *"There are energy experts, a very respected profession, they want to produce and distribute energy, they are taught this way, that's understandable. On the other hand, there should be experts that are in favour of energy efficiency, but they are not organized. So the attitude is one of negligence - as if we are not able save anything that would make a difference /…/ In reality, the potential in Bulgaria is so large, that not only the NPP, many other power plants would shut down if it* [energy; op. DB] *is used wisely."* (building designer, NGO chair.)

BG *"This is not our battle… but yes, there is the nuclear lobby. Then, we have the concept of energy independence, which is my personal cause, and not everybody likes this. At the end of they, everybody looks at their own pockets."* (building designers - architects)

BG *"I think there are long-term conditions for improvement of the certificate, we have trained experts, but there is no* ***political will*** *for that to happen."* (experienced building certifier)

RO In order to positively motivate users to ask EPCs not only for ruled situations (sales, rent, works reception), fiscal legislation shall be changed in the manner of including some (local and/or national) taxes exemptions for buildings in class A+, A and even B (energy and/or CO_2 equivalent emissions). But this legislative transformation needs political willingness which is very difficult to foreseen.

SI *"Look, there are… one ministry is for calculating the energy and the other for the EPC. But look, I don't care about that at all, if you understand me. /…/ I absolutely don't care to politicize about it with anyone. If we don't want to have it – we won't have it. I don't care at the least."* (EPC scheme and concept developer)

SI *"The system in Slovenia is such, that EPCs can be made. That, however, does not mean that the system can't be improved. But I doubt that the existing team* [of EPC developers and implementors] *is prepared to make an effort to improve it."* (EPC issuer)

In this regard, it is worth stressing that **politics have a direct impact on the public perception of EPC schemes**, as is illustrated in the following report from the Netherlands.

NL Some politics in the Netherlands like BVV have been publicly minimizing the relevance of EPC, instilling skepticisms among the population. As a result, 20% voters agreed with that, declaring they are not interested in EPCs.

On the other hand, remarks have been made by prominent policy developers that there is a **lack of interest for communication on the side of individual stakeholder representatives**. In Slovenia, real-estate brokers have been pointed out as a significantly powerful and influential stakeholder group, which – in pursuit of their partial business interests - has largely switched from opposing the EPC scheme to supporting it.

SI *"Surely anything in the real-estate agent's way to profit was an obstacle. Until, clearly, they figured out that they can issue EPCs themselves, and now I think about half of all*

real-estate agents are also issuers. /…/ Today anyone who puts some effort into it can issue EPCs. /…/ They do, however, have to include experts in the process." (EPC issuer)

Similarly, reports have been made by our Dutch contributors, referring more broadly to the **power of the lobbies.**

NL The manufacturer says that based on lobby practices the rating of products in the EP method is influenced. There are many stakeholders that want influence. The manufacturer feels the rating of the energy needs has become less strict due to building companies that thought cost would become too high otherwise; lobby succeeded here.

Due to the divergent and changing nature of stakeholder interests building a coalition of stakeholders is a significant challenge. As we have indicated in several places, policies and legislation, including the practice of how they are enforced, have a significant impact on the uptake and impact of EPCs.

FR In France if there is no obligation, it will be difficult to change the people mind/habits; they will not be interested in. If the new EPC version is based on volunteering, it will be hard to make users interested in.

RO Even if the new EPC will indicate the pollution level (CO_2 equivalent emissions), it is hard to believe that, without governmental constraints (energy taxes, pollution taxes), the users will take into consideration the negative effect of the energy consumption on a sustainable environment.

In this respect, it is easier to understand the following opinion voiced by the Slovenian public authority representative, answering how they understand wide support for the EPCs:

SI *"You issue a law and it becomes widely excepted. /…/ Or to answer the other way around, if we wouldn't have it written in the* [EPBD] *directive, we would never have implemented this."* (public authority representative)

The latter view, which was to lesser or larger extent shared by several research participants, relates to the issues of aversion to change and the complex perception of EPCs, which we discussed elsewhere in this report. Notwithstanding, the idea of **"uniting the stakeholders"** has been pointed out frequently as **one of the necessary steps towards making EPCs a more functional document**. This includes:

- increasing the capacity and motivation of professionals working in the construction sector (e.g. architects, property managers, real estate brokers etc.) to promote EPC-related services,
- connecting different market actors (EPC issuers, architects and planners, banks, real-estate brokers, …) more closely to promote synergies and create supportive environment.

An important and final point, one that takes us back to considerations regarding value of EPCs, is that **new EPC schemes and related business models will only be more successful than the previous one if their value will be known and recognized by non-experts**. Concluding on the U-CERT research results, in many EU countries this will likely be a long process.

Policies, legislation, culture, tradition

In relation to policies and legislation relevant for EPC schemes there are several interesting aspects. Some were already implicitly discussed in past chapters. Such are legislative requirements regarding **policies on quality control** and **requirements for who and when is required to have an EPC made** (selling or buying a property, newbuilds, long-term rentals etc.). In this regard we observe that **legislation regarding EPCs is neither always clear nor strictly followed.** Although most countries have obligatory regulations regarding EPCs these are not enforced and thus are not perceived as a necessity.

BG Generally speaking, only commercial and public building owners are aware of the regulations, but it is accepted that there is no control on compliance.

BG *"For business properties, the image effect is leading. For residential purposes, it is not the case. For them, it is not that important if the building is Class A or A+, or whatever. They don't go for it unless it is required by law. At least the experience with the certificate of the Passive House Institute shows exactly that. People tend to think about it after they complete the construction, when the pockets get thinner, and they ask themselves – why should I spend more money on that? It is another question if there are national stimuli as it is in Germany. As far as I know. There is easier access for to subsidies for those who have certificates, and even more – the better class you achieve, the more money you get. In Bulgaria it is not the case – whatever you do, you get 100%. At the end, people are motivated by the idea to pay less. Even the comfort doesn't play such a role. If you could save from ventilation, you tell yourself – is it that important really, I could always open the windows… Mould, condensation… mot many people are impressed with that…"* (building designer, NGO chair)

BG *"All people should know what the building should look like, why it should be done like that, and how to do it. We must know the meaning of that all. Unfortunately, even our designers are not convinced in the meaning of it (…) Most of all, the designers should learn."* (building designer, NGO chair)

As pointed out with regard to quality control, **failure to comply with the regulation is often not being sanctioned.** In some cases, research participants did not even know they are or were legally required to have an EPC.

BG *"Most of the investors are even unaware that the EPC is needed to acquire a building permit. They only ask for it when the building documentation is collected to apply for a permit, and they ask for it only to fulfil this requirement."* (building designer)

On a related note, relation of EPCs to **legislative and regulative policies** in the broader context of construction sector has also been reported as **not clear** and hence without any significant substance or impact. In some cases, participants pointed out, existing legal requirements do not cover "all important aspects that should be covered" with regard to EPC schemes. Such is the case illustrated by our contributors from Bulgaria.

BG From residential building owners' perspective, there is no pressing need to acquire an EPC.

Single-family buildings are mostly outside the scope of the legal requirements for undergoing energy audits.

EE Single-family dwelling owners who are not interested in selling or renting the property in the near future have no incentive for achieving better measured EPC categories/values.

A Slovenian research participant indicated that **minimal standards for energy management of public buildings and/or big facilities should be enshrined in law**. This, as reported, would bring about efficient change, because such pursuits are simply a matter of delegating responsibility.

SI *"If some building, that has no central controlling system, and uses 1.000.000 EUR for heating, it could save 30.000 EUR per year."* (EPC issuer)

Another aspect related to legislation and policies regards the notorious **public tender policy.** Several experts complained that policy principles behind public tender have negative effects on the quality of EPCs as low price is almost certainly the decisive ultimate criteria for picking the service provers. Under assumption that all applicants are going to deliver good quality service, this does not seem problematic. As this is often not the case, many see existing systems of public tender as prioritization of price over quality and blame this as the reason why quality of EPCs is not as good as one would expect.

BG Some companies allow lower quality especially in cases of tenders under the "lowest cost" criterion, very often applied by public authorities under different funding schemes. In such cases of "mass auditing" (stimulated by public support programmes), there is no real control or penalties and there is no sufficient capacity within the national authorities to impose stricter control.

SI *"MJU* [Slovenian Ministry for Public Administration] *puts out a call for issuers of EPCs. Out of seven offers, two of which stood out extremely, and at the end they chose an issuer that did not even have all the legal requirements to issue EPCs, simply because it was the cheapest."* (EPC issuer)

Such policy and legislation issues are nothing new and should not come as a surprise. **Process of implementing legal and policy regulation changes are notoriously long and difficult**.

SI On all levels, experts complained about the burden of paperwork, administration and restricting regulations, resulting in prolonged processes, less quality and unnecessary costs.

SI *"… it's like so, really, you have to invest a lot of your energy into it, so that you bring it [the national EPC scheme] to life. And at the end it fires back at you anyways, because everyone only sees the negative part of the story, everything that went wrong. They don't see the process and dilemmas that you have fought with."* (public authority rep.)

In contrast some participants called for more regulation, such as that EPCs should be required in more administrative procedures, for instance, when asking for building permit (at municipality level), more subsidies, which could be complemented at local level.

Another interesting aspect of EPC regulation has been pointed out in case of Bulgaria and Slovenia which have a **long-standing tradition of self-building**, especially in the sector of individual family houses. These practices are largely in conflict with state regulations of the construction sector, including the institute of energy performance certification. With the market of construction technologies and materials constantly and rapidly evolving, **there is an ever-wider gap between the knowledge, skills and competences of the DIY builders** on the one hand **and the vision of the future for the housing (stock)**, as promoted by the expertise, the EU, and individual nation states on the other.

Finally, as pointed out regarding cost-effectivenes, access to funding, and related public policies, (in)consistency in legislative aspects in the broad field of EPCs and construction industry is an important factor. In this respect, **inconsistency** has and will continue to have in **a negative impact** on the uptake of EPC products and services.

IT The law seems too complicated for expert and users either. That's because, over the years the law changed too many times.

Awareness building, promotion, marketing, positive publicity

EPCs already **are** (**an important) element of the housing and construction sectors** across the EU. So far we managed to show that most experts involved in the U-CERT case studies recognise the potential for improvement of existing EPC schemes, especially with regard to user experience. A point that unites them even more is that EPC schemes are needed and that they should be appropriately promoted. Many postulated **general lack of awareness** as the main reasons for several shortcomings of the existing EPC schemes.

BG General users are mostly unaware of the application or usefulness of EPCs. Except for building designers, which base their work on the recommendations of the energy audit (which are reflected in the EPCs of existing buildings before renovation), they make little or no use of EPCs whatsoever.

BG Enough information in combination with adequate activities related to awareness raising have the potential to render EPCs interesting for many people.

BG Bulgarian EPC experts equivocally evaluate the general levels of awareness of end users in Bulgaria as very low. Some, however, perceive such levels as common for the whole EU.

SE In Sweden, EPCs have a positive image, however, their full value is missed and not understood which requires down-to-Earth information campaigns for raising awareness.

In this regard, **lack of positive publicity, marketing and promotion** can be seen as the primary source of the problem. Research from most U-CERT partner countries indicates that **active communication campaigns** are indeed a very important factor in the quest for an increased demand for EPC related services. They **improve awareness among general population by clarifying benefits of building renovation and energy efficiency.**

BG *"I am probably biased but I just had a very interesting case. An investor called us for a regular project for renovation. When we got there, we identified lots of opportunities to improve the energy efficiency. He hadn't thought at all about it. We asked if they have*

an energy audit – they didn't have one, although they were obliged to have it. We guided him to an auditing company and the recommendations completely changed the task assignment. From having a project for changing the functionality of the building now we have a project for energy efficiency, including changes in the HVAC systems." (building designers - architects)

BG *"There should be campaigns. There should be available informational materials – where people could read more. The media should talk about it. It should be promoted so that the people could understand that this thing actually exists."* (building occupant)

BG *"At the end, it is all a matter of communication. We've seen a lot a campaigns on many topics on TV and radio, but not for energy efficiency. Energy efficiency is not broadly promoted with end users, but if you approach them not only with the savings, but also with the facts that their children would be healthier, they will themselves live healthier, it will at least prompt them to think about it."* (EPC issuer)

HU A national social campaign would help to understand the importance of EPC. The perception should be changed: users should have the EPC made not only when they sell or buy a property. They should have it made because they want to know how energy efficient their building/apartment is, and what should be improved in order to achieve better energy efficiency and comfort.

ES All interviewees highlighted the necessity of better marketing campaigns to make people aware of the tools available and the goals we must reach regarding the energy performance of our building stock.

Awareness and positive public perception of EPC scheme is also importantly related with the notion of **trust** and ultimately **effectiveness** and **purpose** of EPCs.

EE User trust and awareness are essential for a successful EPC scheme. The cost of the EPC itself is irrelevant if the user does not believe in its value.

The Slovenian contributors reported the opinion by a public authority representative, who claimed that **negative publicity** at the beginning of the introduction of EPC scheme in Slovenia **had a major negative impact** on how it is perceived today. Some of these negative attitudes took form of EPCs being seen purely as an administrative necessity and an unnecessary cost.

SI Certain public institutions were publicly arguing against the scheme, such as Slovenian Consumer's Associations. Now they support it, but informants claim it is *"too late. The damage is done"* (public authority rep.).

Despite differences between EU member states, it is safe to conclude that more should be done across the EU regarding engagement and coordination of activities between key stakeholder groups to promote benefits and market implementation of EPCs and related services. Besides the responsible state institutions, the Bulgarian contributors defined the following stakeholders who seem to have not been engaged (enough) in the existing certification system, or rather, the ongoing certification process:

- Financing institutions
- Real estate brokers

- Property and facility managers
- Energy service suppliers, energy distributors
- Media

Together these stakeholders can build awareness through positive publicity, promotion and marketing. Some of these stakeholders can furthermore be a constructive actor in the processes of education and knowledge building, which is the topic of the following section.

Education, and knowledge transfer

Education and knowledge transfer are two closely related aspects with potentially significant impact on how EPCs are being perceived and used. Awareness seems to be one issue. In its extreme, as pointed out above, **some people do not even know EPCs exist**, even if they were in principle legally obliged to have them made for this or that purpose. Such was the case of Bulgarian contributors, who report that while their focus group participants found EPCs comprehensive and full of interesting information, some of them did not know about their existence before taking part of the activity. On the other hand, some experts believe the real problem is that **people do not have the capacity to understand** what kind of information EPCs promote.

BG *"For sure, the building users are not well acquainted with the content of the certificate, what information it could give to them regarding the building and the building systems. They do not know what the certificate shows to them."* (building designer - engineer)

BG *"I think that if a reasonable investor as acquainted with the audit and the results from it, they would take it seriously and prepare the task assignment accordingly."* (building designers - architects)

Knowledge and capacity to understand are very important in terms of how EPC products and services impact their users. For this reason, it is not surprising that several experts and general users in all of the case studies pointed out **lack of knowledge** as a barrier to efficacy of EPC schemes, and stressed the **central role of education** both for EPC issuers, aspect discussed in the chapter on *Quality*, as well as the general population.

DK It is very necessary to raise people's awareness on the energy efficiency of their buildings, and for which the EPC could be the tool.

FR The major challenge for the EPC today is to make users aware of their climate/energetic impacts. This includes promoting and making explicit the importance of feedback from connected elements. Over-consumption or problems with a house's energy system could be avoided and anticipated.

SI *"It is necessary to talk to people and educate them. Yet no one wants to do that. It is way easier to invest and introduce some sort of new technology than work with people. Coz if you deal with people, you always have some sort of problems, coz they complain… And we, who do this [development of EPCs], are technicians, physicists, and we'll always try to find technical measures, coz that is what we know. It is in our cognitive model."* (building expert)

At this stage it is appropriate to reinstate that the **primary issue seems to lie in the lack of perceived (practical) value of the existing EPC products and services**. As we should have established by now, value of existing EPCs for general population is very poor across the EU, which is why people tend to see them predominantly as an administrative necessity. EPCs have value for people if they find them **meaningful,** which means **they have a recognisable function and/or logic within their life**. With respect to existing features and utilities of EPCs, lack of awareness and knowledge is a secondary issue. **Awareness building and education will have a potential to enhance the uptake and impact of EPCs only once the quality and contents of EPC products and services will have and will be widely accepted to have significant practical value.**

IT Education will not help if EPCs do not offer reliable fact based value for the user.

With regard to awareness and knowledge building among (prospective) EPC users, research participants suggested that there is **a strong need to educate** the end users. For optimal efficiency and impact, informants suggest that communicating educational content through EPCs would be a reasonable thing to do.

SI *"People need to know that there are various types of energy."* (building expert)

Most importantly, there is **a need for EPCs to be a reliable and trustworthy source information**. Many research participants pointed out that **there is a lot of unreliable and confusing information about energy efficiency and building renovation**. Many experts see **EPCs as a potentially powerful tool for building a national-level housing stock database**. This was framed as a key need that would serve for assessing the overall condition of the building stock and drive necessary policy changes.

ES It is a very useful tool to catalogue the existing buildings stock and more intensity in promoting it should be done.

From the other side, there is also a need for comprehensive and user-friendly source of information regarding the EPC scheme and EPCs as such. As shown in the chapter User-friendliness, people find existing EPCs often incomprehensive, which has a negative effect with regard to efficient knowledge and information transfer. As concrete steps towards setting up an efficient communication and education strategy for EPC users, U-CERT research participants suggested the following:

- **Provide access to educational content** via
  - A web platform.
  - EPC issuers
  - Professionals working in construction sector and building maintenance (e.g. housing managers)
- **Engage business actors** in proactive promotion of EPCs and EPC related products and services.
- **Communicate using visualisations.**
- Offering retrofit solutions supported by **benefits** and **reliable financial parameters**.

8. COMPARABILITY OF EPCs

Comparability of EPCs is as much an attractive idea as it is a difficult goal to achieve. As much as it seems logical that EPCs would serve as a reference point between properties it turns out that the variety and complexity of factors involved in a process of issuing individual EPCs makes that a very difficult task. The difficulty becomes increasingly hard with scale, or perhaps more accurately, with distance. While it is hard to make meaningful comparisons between EPCs of two different buildings form the same city or village (for reasons of difference in materials, typology, purpose and patterns of use, user habits etc.), it is increasingly hard to make the a comparison of one or both of those EPCs with buildings from another region or country (different climate, deferent markets, different legislation and regulation etc.) made by another EPC issuer and possibly using a different calculation methodology. Nonetheless, since the idea of value and utility of existing EPCs has been closely associated with the notion of comparatibility and EPCs as benchmark reference points for determining the quality of housing, in this chapter we look at som most prominent aspects of EPC comparatibility, going from local and regional levels the level of the EU as a whole.

General outcomes

- **Enable comparison of EPCs on national and international level**
    - **Universal format** – digital and/or physical but with similar design, content and functionalities.
    - **Universal indicators** – e.g. costs for energy expenses per household/size of property
    - **A shared database** for certification parameters like energy factors, weather files, PV calculators etc. Some of them have been reported to already exist but their use has not spread yet.
    - **Distinguish between absolute and relative values.** Distinction between the absolute terms and the comparability between different EPCs must be clear.
    - **Explain difficulties of comparison.** Conditions and contexts of EPC schemes vary significantly between nation states. That should be made clear and presented in a sensible way.
    - **Offer expert-moderated digest of information** – due to complexity and difficulty of comparability, digests of data and information tailored to popular interests could be a step towards both popularizing EPCs and giving them an extra level of user-centred value.
    - **Include both relative and absolute values/indicators.** As is the case of listed (historical) buildings, some buildings are unlikely to be significantly improved in terms of energy efficiency. For such cases, relative indicators are necessary that contextualize and give a more realistic image of possible measures.
- **Enable comparison of EPC schemes on the EU-level for experts (policy developers and implementers, EPC issuers etc.)**
    - **Financial and business models** – information on costs for EPC services.
    - **Public support systems for EPC-related fields** – institutional and legislative architecture supporting EPC schemes.
    - **Universal EU scheme/modules** – standard certification scheme (modules) which is accurate, allows comparability, and serve as benchmark reference point for investments.

- **Define national and regional specifics** – define the framework for meaningful comparison.
- **Define border conditions for market activity** - EPC schemes should evolve to reflect the needs of the market and energy-related services on the national and EU levels.
- **Promote knowledge transfer and exchange of good practices for experts** – this existing but limited aspect proves to be one of the few widely desired and accepted functional aspects related to the idea of EU-level comparison among policy developers and enablers.
- **Develop universal EU level software solutions.** As a strategy to enable EU-level comparison, universal software tools appeared as a possible direction for development of EPC schemes.

Comparison – local, regional and national levels

People understand the world intuitively, drawing conclusions on their experiences, knowledge and other aspects of everyday life they are most familiar and comfortable with. In that way they also tend to understand EPCs and their implications – through comparison with reference points within the scope of their knowledge and experience. For this reason, **comparisons with the Others** tends to reappear frequently within our research, sometimes as a response to peer pressure (to avoid some form of social condemnation, mockery or exclusion), sometimes as aspirations to be equally good or better than the Other(s).

BG *"The question 'Where do I stay compared to others?' has the potential to unlock the initiative and provoke the interest towards the EPC*." (building designers - architects)

ES *"The main objective of an EPC is to provide information to a middle-person or to a final user regarding the energy efficiency level compared to a reference, in terms of demand and energy consumption. It is a comparative element."* (guideline developer)

Undoubtedly value of things is determined contextually – in relation or with regard to something with comparable value, function or purpose. Bulgarian contributors pointed out that end users are interested in understanding where their building stays in terms to the general/average level and how much more/less they pay for energy compared to other users in similar situation. Variations of this essentially pragmatic aspect are reflected also in the examples below.

BG Bulgarian contributors reporting on comparison between the Bulgarian and German EPC schemes. "*There is easier access for to subsidies for those who have certificates, and even more – the better class you achieve, the more money you get. In Bulgaria it is not the case – whatever you do, you get 100%. At the end, people are motivated by the idea to pay less. Even the comfort doesn't play such a role. If you could save from ventilation, you tell yourself – is it that important really, I could always open the windows… Mould, condensation… mot many people are impressed with that…"* (building designer, NGO chair)

HU Tools and further requirements can be introduced to accelerate renovations. For example, in Great Britain and in other countries as well, they started to introduce a condition for leasing a property, so it has to be achieved a certain energy performance.

For individuals who had the capacity to understand EPCs, the aspect of **comparison** has proved to be particularly desirable. This function makes EPCs a meaningful tool in the context of following the impact of individual interventions into buildings energy efficiency.

BG *"The change of the performance from class E to A is very impressive."* (facility manager)

In the case of listed historical buildings, the indicators should report not exclusively absolute values but relative values as well. As reported by the Slovenian contributors, the data provided in the existing EPCs are absolute, which gives a reference to where a building is in comparison with the existing standards for energy performance of buildings. What it does not provide is a reference to what level of performance the building could actually achieve accounting for its properties – age, condition, monumental value (and protection) etc. In this regard, the old and historic buildings will always be a

case where existing EPCs will communicate poor values, even if the owners/managers implement all measures possible in the scope of their limited possibilities.

SI *"I think, that it* [the EPC for historical buildings] *should be displayed in the following way – where a maximal reasonable performance is achieved, disregarding the actual category, it should be marked green. Because there are no other solutions or it is too expensive."* (public investor)

Existing EPCs, however, only provide static (calculated or measured) information on building/property's energy use. **Digitalisation of EPCs** and including **real-time information** on energy use is reportedly perceived strongly positively and a significant potential of future EPCs to influence people's practices of energy consumption and use as well as streamlining the certification process.

EE Only development possibility is digitalization, so that normalisation with weather data would be calculated automatically in the EPC register database.

RO The new law for the electronic signature used by energy assessor will help the digitalisation process of the EPB field. As well the envisaged application for automated official registration of EPCs in the national database will ease and speed up the hole process.

SI *"They are useful, when they are accessible, when you can take action. If you get to know in 4 months' time, that you've used too much energy in energy in January, that doesn't make any sense. But if you could get to this information, through this* [hypothetical] *information system, say, in the following month, and it would be virtually free, I'd say – why did we use so much the past month?"* (EPC issuer)

Combined with **comprehensive visual representation**, visualised comparable data on real-time energy consumption can therefore be regarded as one of the potentially most impactful and distinctively positive features of future EPCs. In other words, knowing **where you are positioned in relation to your peers and having control over the building's energy performance is a key motivating factor for a lot of people.**

BG *"I want to know, for example, how much energy I spend for lighting, for the refrigerator, for the washing machine, for other appliances… for my electrical car, if I had one. Even the appliances on standby spend considerable amounts of energy. This could have impact on the behaviour of the users, thy could even lead to replacement of the appliances."* (building designer, NGO chair)

BG *"If my electricity bill is increasing, I would like to know what is the reason i.e. I need real time monitoring. If I am renting or buying, I would need to know what are the project characteristics, so what I am going to pay. I don't see why any of these should be excluded as information."* (building designers - architects)

BG *"Well, the energy consumption is something which is an abstract number and not really practical for the end user. Now I am thinking... what if there is a database where every owner could compare its consumption to a reference number for a similar residential*

unit, e.g. what is the average consumption of an apartment of 100 sq.m. with 4 residents." (building designers - architects)

Some experts, however, see digitalization as problematic and claim that in order to digitalize EPCs, a new (calculation) methodology is necessary. Besides digitalization, on the level already largely functional, importance of **publicly accessible EPC databases** has been pointed out more than once. Although existing EPCs have limited value for an average EPC user, it does have potential to **enable a certain level of comparability of information** and make EPCs a tool and reference point for comparison between different properties. At present, there are significant differences between MS in how accessible national EPCs databases are. Some countries have a publicly accessible database, for some reports explicitly noted that although EPCs are publicly accessible in theory, the access is difficult, finally there are also a few who do not have a publicly accessible EPC database[2]. Of the countries included in the U-CERT study who do have access to the database, however, none has been reported to offer exemplary **comparison functionalities** that would create added value for users.

EU-level comparability

As with many other topics, the attitudes and beliefs regarding comparability of EPCs differs significantly. The overwhelming majority of experts expressed skepticism regarding the idea of a universal EU-wide comparable EPC scheme/model and argued in favor of schemes that address and reflect the specifics of individual MS. Belief that **EPC schemes should be tailored to the particular nationally specific contexts** was voiced by several research participants across the EU**.**

BG *"My long-term experience in implementation of EU policies and practise and also my discussions with colleagues from other national agencies responsible for these actions shows that there should be some flexibility. Models that are to be identical to everyone rarely work well."* (public authority representative)

EE Fair comparison amongst the member states is as much a political decision as it is a factual one – CO_2 emissions from a country are much tied to its local conditions, such as size, available energy carriers etc., and the procedure of how this is normalized among member states is unclear.

Many U-CERT research participants believe **comparability of EPCs on the EU level is obsolete**.

HU *"The question is why do we have to compare buildings of different countries? It will never be necessary to build a house in Mediterranean countries like in North Europe. Comparing buildings with the same climatic conditions may make sense."*

"The certification schemes valid within the given country should be maintained, it is not necessary to standardize them and neither make them comparable at EU level, but it may be interesting for professionals how the certificates made in different countries

[2] According to data from 2015, countries that do not have public access to EPC database are Denmark, Croatia, Finland, Romania and Greece (See Energy Performance Certificates EPC accross the EU – A mapping of national approaches, pg. 37) <https://www.bpie.eu/wp-content/uploads/2015/10/Energy-Performance-Certificates-EPC-across-the-EU.-A-mapping-of-national-approaches-2014.pdf>

relate to each other, e.g. the requirements to which each classification is compared in different countries."

Others believe the idea of comparability does have **a certain level of relevance.**

HU *"EU comparability can be ensured by introduction of a unified calculation method and software and application of a dynamic model. The requirements must take into account the climatic conditions specific to the area. Application of a basic building model based on appropriate statistics."*

ES The comparability between countries is very useful for the building sector. However, maybe the same "language" should not be used, since it is not the same having an A rating in the North of Europe than in the South. It is interesting to explore this. The foreigners coming to Spain, wanting to buy a house, value EE of the building a lot.

ES It could be beneficial to have some kind of comparability at European scale, because if the methodology was agreed at international level that would cause having better quality EPC, better communication of the final product, … Also, it could trigger international investments, which though may not affect the majority of the building stock, could be positive.

In this regard, it is important to stress that the vast majority of U-CERT research participants had **little knowledge regarding the situation with EPCs in other EU countries**.

BG In case of Bulgaria, research participants commented that EPCs in other EU countries are likely a factor for access to different support schemes and that – particularly in the UK and Italy – public interest in EPCs is greater than in Bulgaria.

NL When you have operational data, the national differences do not matter anymore. Differences among countries are large (building use, building construction, weather conditions, etc). But the way we monitor can be the same. We can certainly learn from each other.

While lack of knowledge in this area was widespread, people who had some level of knowledge in this respect were notably experts and individuals with experience of life outside of their country of origin.

BG Some Bulgarians renting dwellings abroad have had positive experience with EPCs. They describe their experiences as a potential driver for the demand at home.

Several U-CERT contributors reported that **comparison on the EU level does not have much purpose** and use for general users.

HU Taking into account our non-expert informants' opinion, the end-users do not want to compare the national EPC results with results from other countries. What they need is a reliable, useful national EPC, which really has the capacity to improve the energy efficiency.

For expert use, on the other hand, opinions have been more positive.

HU An EU-wide reliable comparison would help decision makers of EU in evaluating the energy performance of building stock in different countries. This may be used to allocate subsidies among MS.

IT Efficient comparison across EU can be understood as a potential for meaningful exchange of knowledge and experience in the broad field of EPCs.

On a related note, many experts claimed – somewhat cynically – that **purpose of the existing EPCs on the system level** is primarily for MS to meet the requirements of the EU.

BG The existing EPC scheme is a tool for to fulfil obligations to the EU and it will continue to be so.

NL The policy officer thinks that the certificate is produced now of sale and contains generic information. This generic information (e.g. generic cost efficient measures) is demanded by the EU, while the buyer/renter or the building (residential as well as non-residential) needs advice that is adapted to his needs since his use will possibly be different, but that is not the advice given on the label.

Furthermore, the Slovenian contributors report a view by an experienced EPC issuer describing EPCs as a statistical tool for the state to report energy savings to the EU.

FR Experts agree that EPC should explain or express if a building is compatible with the European energetic and carbon objective for 2050.

SI *"The state does not give subsidies, the state is buying savings. If you will refurbish a school and spend 10 000 L of fuel oil per year less, the state just bought such and such amount of CO_2 emissions. And now all measures go somehow in this direction. /…/ It can do so with its own buildings, or it can 'buy' it from its citizens. In this context, it [the EPC] is a relatively good indicator, as to how much do we actually spend. /…/ While – how useful this is for the end users – is another question."* (EPC issuer).

These claims do have a point in the context of EU ambitions to decarbonize the EU housing stock by 2050. As explained by our Hungarian contributors.

HU The overall goal is to achieve decarbonised building stock by 2050, so EPC shall provide information not only for end-users, but also for experts and policy makers. The EPCs of the building stock presents basic data for experts and policy makers. The EPCs contain those essential data that is necessary to develop programs and strategies to improve energy performance of building stock. They have to see which kind of renovations have been implemented and what the results are and how the building construction sector has been evolved. The aim of the ministry is to make as many EPC as possible in order to get more information on energy performance of the building stock.

Coming back to the main point, the **comparability** on the level of EU, phrased as one of the goals for the future EPCs, was generally **perceived as a considerable challenge**. Reasons for that include:

- Variety of building typologies and building structures
- Age and physical properties of buildings

- Climatic conditions, heating/cooling needs
- Different user habits and user profile
- Variety of technologies and housing systems in use
- Markets and market specific available technologies
- Socio-cultural, political, economic, legislative contexts
- Diverse structure of ownership
- State/region specific standards and patterns of construction
- Highly variable (cultural) perceptions of IEQ.
- A variety of methods and formats of data sets produced

Unsurprisingly several experts from across the EU expressed **skepticism and lack of need for comparison** of EPCs on the EU level.

IT Some experts fear that the Italian reality is too different from other European countries and that this may lead to difficulties in applying the new hypothetical schemes.

ES The discrepancies of the different technical software that can be used to issue an EPC. In theory they should abide by the same technical requirements, but the reality is that different procedures applied to the same building yield different results. Fortunately, the final user is not aware of this technical problem.

Several expert research participants also pointed out the fact, that member states use their own certification system from the very beginning and that there is no common method. As a result, it is **now very difficult to change the existing national EPC schemes** to a common international EPC scheme, even if this seems like a desirable idea.

SI Slovenian public authority representative expressed need for more guidance from the EU for implementation of EPBD on the level of MS institutions. They commented that the EU commission would do well to provide support and ensure comparability on the EU level. They specifically pointed out the methodology for calculating EPCs. In contrast, an experienced Slovenian EPC issuer claims it is more “democratic” to leave each MS free hands with their EPC scheme.

FR Many informants did not see the point of having a European tool for the energy performance certification of buildings. They had to make an effort to give some feedback on this topic and hadn't really thought about it before.

Hungarian contributors reported that the common certification method should have been introduced in the beginning, not now. An interesting view on why the comparability of EPCs hasn’t been a goal of EU policy makers from the very beginning was shared by a Hungarian participant. In his opinion it was **the difference of living standards** and the costs related to issuing an EPC.

HU *“The main argument that EPC has been delegated to national competences is not that the different climate and building stock, but the expected workload and the amount to be paid are different per country. The amount to be paid by a customer and the amount of work to be done and the software to be purchased can vary greatly from country to country.”* (certification scheme developer)

The other difference, as pointed out by a French research participant, is one of **shared standards** – in their case for a Passivhaus and building material – both **in the construction market** and **in the certification**.

> **FR** *"In France the Passivhaus is not recognized by regulation. It is recognized only our RT2012 regulation. And so, a building made with the Passivhaus specifications will not be in conformity with the French regulations, it will have to respect our particularities to be valid. that's the great difficulty. Our products are not certified abroad and vice versa."* (expert)

In contrast and in line with U-CERT aspirations, reports from our Spanish partners were cautious but optimistic.

> **ES** If U-CERT brought reliability to the market, then EPC may be refunded, gaining weight in the market. Maybe standardization at EU level, everybody using the same climatic data, and primary energy factors, also trying to correct the mistakes made at national level. It would be like starting again, but with greater value. It would be very valuable, but it should be done with a regulation mandatory for everybody. If a directive is issued, and each MS does its own interpretation, we would be prone to repeat the same mistakes.

Then again, **that EPC schemes are difficult to maintain comparative quality of EPCs already on the national level,** let alone on the level of EU as a whole**.**

> **EE** For net energies, the local conditions in each member state are too different for developing a harmonized calculation method of EPCs. It is already challenging for EPC issuers within a single member state and its legislation to arrive at identical EPC calculation results. This will only further be amplified when considering the scope of the EU.
>
> **IT** The certifying technician in a region cannot operate throughout the national territory.
>
> **SI** *"Because every building is just... With cars you can do it, right… But every building has its own components and it is just hard…"* (scheme and guideline developer)

The prospect of **comparability** is therefore **generally disregarded as being significantly beneficial** aspect of future EPC schemes.

> **EE** Comparability is not a priority for smaller member states, as its usefulness is limited due to the small scale. Efforts should instead be made on quantifying the equivalent carbon footprint amongst the building stock in EU.

Despite all doubt and arguments against EU- level comparison, there is a point worth highlighting that unites virtually all research participants who voiced their opinions on the topic. Experience from U-CERT show that both **public authorities and energy experts/EPC issuers are keen to be involved and learn from foreign experience.** This includes EU research and innovation projects such as U-CERT, actions such as CA EPBD, or activities of the likes of European Energy Network. These were described as "interfaces" for exchange of topic-related experiences and knowledge between the national authorities and experts.

IT Creating space/possibility to exchange knowledge and experience among experts across the EU is key for achieving comparability.

Promotion and education based on good practices has been reported both as desirable as a potential driver of demand for EPC products and services.

IT First of all, people would like to understand what is the situation of EPC in Europe.

What is more, comparability of EPC related policies and practices between EU member states as such has been reported as a potential **vehicle for positive change.**

BG Some participants of Bulgarian focus group insisted that EPCs are far more popular in other countries in EU, where they are required for dealing with real estate properties, whereas they believed that in Bulgaria this is not the case.

Experts from Bulgaria pointed out that there is plenty of potential in adopting effective policies from across the EU. An example, Bulgarian contributors report, would be the principle **"the more you save – the more you get"**, which has been successfully introduced Austria and Germany and is significant as a motivational strategy for professional users.

BG *"As we know, in Germany usually the practice pulls the norm. This is because there are incentives for the practice to be more ambitions compared to the norm. It is not the case here, but still, the norms are developing following the international levels."* (building designer, NGO chair)

As pointed out in the previous chapter, adopting and implementing policies is always related to the notion of "political willingness". Although representatives of both public authorities and various EPC experts express willingness to follow the best EU practices, practice shows adoption of such practices all too often stays at a declarative level, unable to transform into any form of action.

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