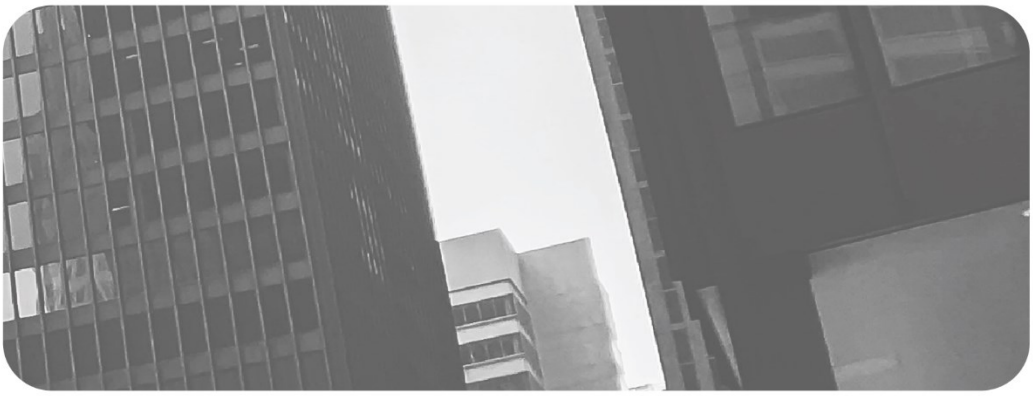
D5.3 Catalogue of user and beneficiary profiles for tool development for task 5.4



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

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.

ROI: Return on Investment

SRI: Smart Redlines Indicator

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Executive summary

Key aim of Deliverable 5.3, Catalogue (report) of user and beneficiary profiles for tool development for Task 5.4, is to demonstrate the results of the Task 5.3, Identification and categorisation of end-users needs for U-CERT services and business models. As stated in the title of D5.3, the results of the task T5.3 feed into the Task 5.4, Supporting tool development, aimed at accelerating development of specialized digital tools designed to support stakeholders of EU member states with implementation of the new generation of Energy performance certification (EPC) schemes. D5.3 is also strongly related to WP2, particularly with the Task 2.3, Analysis of users' perception about EPC schemes in U-CERT countries, which aims at collecting and interpreting various perspectives on EPCs based on user feedback in order to identify the key features of the user-centred next generation of EPCs across Europe (D2.3 due by M18 of the project).

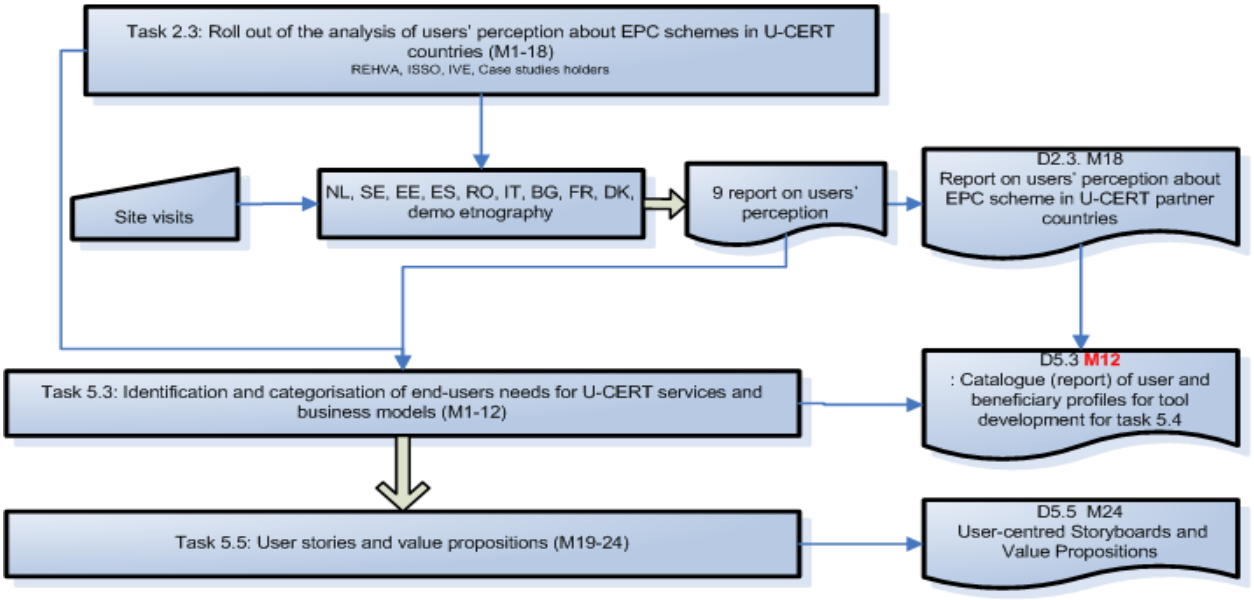

Figure 1: Scheme of relations between Tasks and Deliverables.

The overarching study approach is based on the four steps of the People-centred development approach. 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 1, the goal of the Tasks 2.3 and 5.3 is to research and interpret needs and expectations of key target stakeholders as potential future users of our U-CERT solutions, following the phase of identification done in the Tasks 2.2. Task 5.4 is the following step, moving from interpretation towards design, development, and testing.

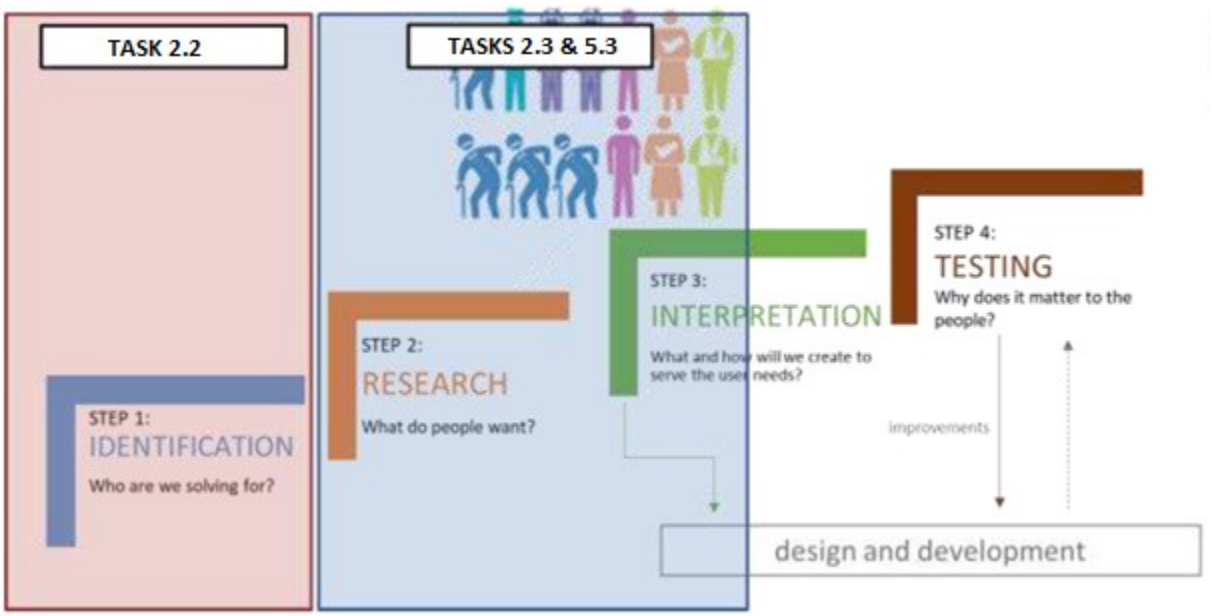

Figure 2: Tasks 2.3 and 5.3 integrated into the People-centred design & development approach.

Research associated with Task 5.3 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 firstly understanding 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.

As the title suggests, the Deliverable 5.3 report is essentially a Catalogue of EPC-related stakeholder profiles featuring information shared by profile representatives from across the EU. The introductory chapter explains the analytical concept and methodology behind the research conducted under the Task 5.3 and associated activities. The catalogue is divided into two main chapters – EPC Experts and EPC Users – each containing six individual catalogue items outlining the needs and expectations of the corresponding EPC profiles. The analytical structure of the catalogue is designed with intention to present the diverse and multivocal viewpoints held by the featuring key stakeholders and present the variety of attitudes and beliefs, which co-create the current landscape of EPC related topics.

Despite such an open format, the research provides ground for some general conclusions:

- The theoretical concept of EPC products and services is generally perceived as **positive** and having considerable **potential** for impact on Energy performance of buildings. In practice, however, this potential has not been fully realized.
- From the user's perspective, existing EPC products and services are predominantly perceived as an "**administrative necessity**" rather than a valuable and meaningful product and/or service. This opinion is largely shared and grounded in experience of representatives of both expert and user profiles.
- The design and content of the existing EPCs are **strongly expert-biased**. For users with little relevant knowledge background they present **poor value** and are often described as being difficult to understand or even "useless" therefore information could be presented in stakeholder **tailored** modules.
- 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.
- Developers and implementers of future EPCs should 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.
- 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. They 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.
- 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. 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**. 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.

Introduction

Deliverable 5.3 is a catalogue of EPC profiles outlining their needs and expectations with consideration of the existing EPC schemes and their potential future development. The catalogue is divided into two broader categories – EPC Experts and EPC Users. Practice shows, however, that the notion of *users* is being utilized in a variety of contexts. In the broadest sense of the term, *all* of the profiles listed in the catalogue can thus be interpreted as *users* of EPCs and certification services. Division between Experts and Users is therefore primarily useful as a reference point which helps us better understand the differences and similarities between information shared by representatives of profiles featuring in our report. These include their beliefs, opinions, and attitudes regarding the existing and future EPCs, the certification scheme, and policy's purpose at large.

Expert profiles tend to understand EPCs and the certification process from the systemic point of view. For experts, an individual EPC and the act of its issuing - the individual instance of certification – is less important than what lies beyond them – an intertwined network of systems, policies, and structures. The user profiles, on the other hand, are more focused 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. This division helps us analytically reflect on the complexity of EPC related policies and the particular ways they play out in practice. Understanding and acknowledging these essentially different viewpoints 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, this 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.

It is important to emphasize, that most of our informants represented several EPC profiles simultaneously. Their views regarding the EPCs presented us with a wide range of information and insights, some of which tend towards the extremes and other seek balance between the two. For this reason, we should understand individual EPC profiles as analytical reference points on the continuum between the two extremes – the systemic (macro-level) and localized (micro-level) viewpoints. Such analytical approach can be useful from a theoretical point of view, such as for mapping the relations between key stakeholders (representatives of individual EPC profiles). In practice, however, such an essentialist perspective rarely proves useful.

For this reason, the catalogue items – each representing viewpoints of an individual EPC profile – do not offer exclusive and refined information adhering to either purely systemic or purely localized viewpoints. They are rather a collection of viewpoints shared by informants from various EU member states who – among others – represent the particular profile in focus. Hence, Expert profiles offer not only insights referring to deeply structural and systematic perspective but also opinions and suggestions regarding pragmatic value and users' needs. Similarly User profiles offer not only information helpful for understanding the (potential) pragmatic value of EPCs, but also offer explicit or implicit references to strengths and weaknesses of EPC schemes and their underlying policies.

Key outcome

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. In practice, however, they are more often than not 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 a quantitative reference point. An individual EPC only really makes sense as a quantifiable data set used for building clusters analysis. In contrast, from the pragmatic localized – user – perspective, EPCs are a qualitative reference point. An individual EPC should only serve to present the unique condition of one 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. As such, the purpose EPCs 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.

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. 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 future of 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 of all new 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.

Application of results for Task 5.4

The catalogue includes a variety of useful information. One of the aims of D5.3 is to provide input for T5.4, providing the developers of U-CERTS solutions with insight to develop meaningful people-centred solutions with considerations of both expert and user expectations and needs. The implications and the possible use of information gathered through our ethnographic research, however, goes beyond the specific needs of the Task 5.4 and indeed beyond the U-CERT project. The catalogue items are structured with intention to highlight 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.

Profiles as presented in this catalogue have a dual function. On the one hand, they present a set of key stakeholders and roles they play in the context of development, implementation, and realization of EPC schemes across the EU. On the other hand, the variety of attitudes, opinions, suggestions, and ideas presented in each individual profile clearly display the variety of viewpoints held by the representatives of the same profile. **Some of the recorded viewpoints are clearly contrasting** or plainly contradictory. On the other hand, our format enables us to track ideas across the spectrum of expert and user profiles presented in our catalogue. It shows that certain expectations and needs, such as specific suggestions for improved design or improved contents for users with little background knowledge, are **shared** between many of our informants disregarding the specific profile function they represent. In the context of developing the next generation of EPCs, this catalogue provides ground for development of products and services tailored to not only various *building* types, but also *user* types and their *purpose* of use.

Task 5.4 – Supporting tool development – aims at accelerating development of specialized digital tools designed to support stakeholders of EU member states with implementation of the new generation of Energy Performance Certification (EPC) schemes. It is closely related with Tasks 5.5 and 5.6, which are aimed at development of user-storyboards needed for business models, products and services developed in the context of the U-CERT project. The digital support tools, as referred to in T5.4, are:

- Comparison and calculation toolkit
- Product supplier service tool
- Open data tool
- Building Operational Rating tool

Inputs for development of **Comparison and calculation toolkit** can be found in all catalogue items under the section Quality, specifically categories containing Method related statements. Alternatively we suggest searching the document following keywords, such as – comparative, comparison, comparable, compare, calculation, calculations, calculated. Most valuable inputs for **Product supplier service tool** can be found in the catalogue item Product manufacturers & product and service suppliers. Most valuable inputs for the **Open data toolkit** are likely to be found in catalogue items presenting information shared by professional market actors under the categories Purpose & Content and Quality. This includes all profiles listen in the Expert profiles chapter as well as some profiles listed in the Users chapter (Building professionals, Involved craftsmen). Most valuable inputs for the **Building operational rating toolkit** can be found in all catalogue items under the category User experience and utility as it is specifically focused on aspects of usability, utility, meaningfulness and value for the user. Alternatively we suggest searching the document for key words such as – decision, decision making, ISSO, standards etc.

Research and method

In the U-CERT ethnographic research (Tasks 2.3 and 5.3) we collected and interpreted viewpoints, opinions, and feedback from a number of EPCs Experts and Users covering the whole spectrum of profiles listed below. In this catalogue of EPC profiles we present 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, which will be presented in detail in D2.3 report.

For the Task 5.3 we practiced three primary methods commonly used in ethnographic research. Most frequently we used 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 are 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, we used the method of participant observation whenever possible. 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.

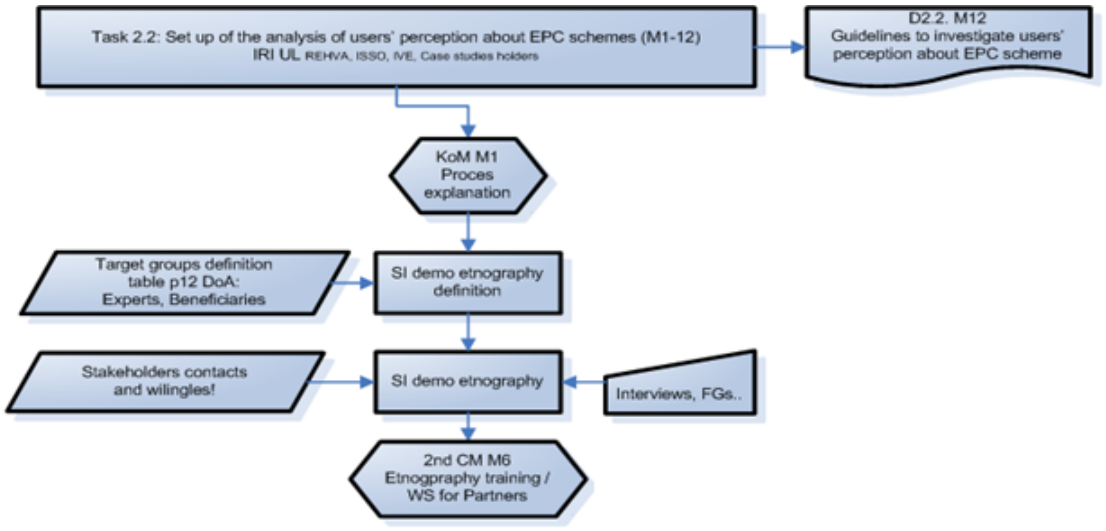

Figure 3: Ethnography guidelines development and dissemination scheme.

Due to the COVID-19 pandemic the research activities planned for Task 5.3 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 deemed to contribute to this deliverable were unable to conduct any kind of meaningful research. Nonetheless, with appropriate mitigation actions, the vast majority of the partners managed to gather a substantial body of quality quantitative data in the originally defined timeframe. Despite the difficulties we faced, we believe that our report delivers all the information promoted in the U-CERT project proposal and presents readers with insights valuable in the context of further U-CERT developments and beyond.

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 (D5.2) following the methods described in the guidelines for U-CERT ethnographic research (D2.2). In total, 91 semi-structured interviews and 9 focus groups have been conducted involving 162 informants and focus group participants, 82 of which can be categorized as EPC Experts and 80 as EPC users.

	Informants and participants Total No. (No. of Experts/Users)		**Semi structured interviews**	**Focus groups**
BG	18	(6/12)	11	1
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	**162**	(82/80)	**91**	**9**

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

Format and structure

The catalogue is essentially a revised and upgraded list of EPC users and beneficiaries as defined in the original U-CERT project proposal. Each catalogue item presents a particular EPC profile. These are divided into two main categories – EPC Experts and EPC Users. **EPC Experts**, also referred to as professional market actors, are representatives of institutions and individuals that develop, implement, and control the quality of EPC schemes. They have a good theoretical and systemic overview of EPC schemes and its implicit or explicit values. Typically, they also have the best foresight for potential developments of the existing EPCs**. EPC Users**, also referred to as (potential) beneficiaries, are representatives of institutions, businesses, or individuals, who generally perceive EPC scheme as a service and EPCs as a product and use it locally. They experience the EPC scheme as a service – or an

administrative necessity – and describe their experience from a standpoint of practical use. They tend to have a limited capacity for imagining possible future developments of the EPC products and service but can reflect on how the theoretical value of EPCs translates –– more or less meaningfully – into practical aspects of their everyday life and/or business.

The format of each user profile – catalogue item – comes with:

- a key,
- profile description and contextualization,
- a list of informants included in the analysis indicating their background, and
- a table of expectations and needs.

The Key explains key reference points – the role, motive/interest, and key value of the informants' contribution to the U-CERT ethnographic research. This is followed by a short generalized description and contextualization of the individual profile and a U-CERT reference indicating how the profile is relevant for the broader context of the U-CERT project.

The information shared by our informants is presented in table divided into two main sections – Expectations and Needs. Division between expectations and needs serves primarily to separate the more general – expectations as attitudes, opinions, ideas, beliefs – and more specific – needs as more concrete suggestions regarding possible positive developments of future EPC schemes, including examples, measures, and necessary steps to realize such change.

The analytical structure used to present gathered information repeats in both of the sections. The content is structured in several categories and subcategories highlighting key topical strands that we encountered throughout our research. Individual pieces of gathered information usually feature a key topical statement or sentence (bold text) followed by a short analytical contextualization provided by our contributors (U-CERT researchers). Where applicable, the statements are further characterized by comments and illustrations provided by our informants (representatives of individual profiles). For more transparency, contributions by individual partners involved in the project are marked with bolded initials of the country they represent.

PROFILE CATEGORISATION

The Key

Key role: Profile's key roll in the broad context of EPCs**.**
Key motive/interest: Profile's key motive and/or interests in the EPCs contexts.
Key insights: Profile's most valuable contribution in the context of U-CERT project.

Profile description

A short contextual description of the profile. *Lorem ipsum dolor sit amet, consectetur adipiscing elit. Donec non orci mattis, mattis velit eget, hendrerit felis. Mauris odio nulla, vulputate vitae pretium maximus, vehicula in metus. In dui neque, maximus ut tellus eu, mattis sodales dolor.*

U-CERT reference ● Profile related content from the U-CERT project proposal. *Quisque suscipit risus ac consectetur pulvinar. Vestibulum ante ipsum primis in faucibus orci luctus et ultrices posuere cubilia Curae; Aliquam placerat, augue nec viverra viverra, tortor mi dapibus turpis, ac elementum massa mi eu turpis. Aliquam erat volutpat.*

List of contributors

HU Examples of informants from individual MS.
NL Examples of informants from individual MS.
SI Examples of informants from individual MS.
…

Expectations

PURPOSE & CONTENT

General statements
General statements related to the purpose and content of EPC schemes.

EU-MS divide
Statements and comments referring to or illustrating how the concept of EPC schemes is understood on the relation between the EU and its member states.

Expert-user divide
Statements referring to or illustrating the two very different approaches to understanding the EPC products and services – the expert on the one side and user on the other.

QUALITY

Method related
Statements referring to the EPC method.

System related
Statements referring to the wider structures of the EPC concept.

Expertise related
Statements referring to the expertise – EPC issuers and other key stakeholders – involved in the EPC scheme.

USER EXPERIENCE AND UTILITY

EPC product
Statements related to the EPCs as a product of EPC scheme. This segment is usually subdivided into the design and content with utilities. The sub-category of design contains statements referring the actual design of EPCs, such as visual elements, structure of the document, the format in which information should be presented etc. The sub-category of contents and utilities contains statements referring to its actual content and utilities, such as the specific information included in the EPCs, specific tools and functionalities they should offer to the user etc.

EPC service
Statements related to the EPC certification services of EPC scheme. As the EPC product, the EPC service segment is usually subdivided into the design and content with utilities categories.

PUBLICITY

This section includes comments referring to promotion, publicity, and marketing of EPC services.

MISC

This section includes comments which do not fit under the above categories.

Needs

The above structure repeats.

Figure 4: A structural outline of an individual catalogue item.

EPC Experts

EPC scheme and guideline developers

Key role: Content developers.
Key motive/interest: Integration of knowledge/technology with emerging policies.
Key insights: Insider's viewpoint of EPBD realisation process.

Experts in energy performance of buildings and other fields related to EPBD and EPCs (e.g. building sustainability and construction). They are familiar with available resources (e.g. state-of-the-art technologies and software, services etc.) and existing baseline knowledge necessary to set up guidelines for the implementation of EPC schemes. They have the necessary knowledge and relevant insight to suggest possible EPC schemes that would optimally fit the specific (usually nation-state) context in which EPBD and EPCs are being introduced.

U-CERT reference ● *Public authorities responsible for development of certification schemes are lacking sufficient capacity and need appropriate through external experts.*

U-CERT will assist the partner countries involved in the consortium in the process of drafting the national implementation of the Energy Performance Assessment and Certification, and the integration of the Smart Readiness Indicator with a holistic end user-centred approach.

Informants' backgrounds by countries

BG Head of direction of the responsible public authority.

ES Voluntary building certification scheme guideline developer.

HU Certification scheme developer.

IT Engineer and head of an association.

NL #1 Senior consultant of national standards body.

#2 Senior consultant of national standards body.

RO Professor, president of a professional association.

SI Head of a well-established institute dealing with environmental technologies in buildings.

Expectations

PURPOSE & CONTENT

General statements

Low expectations of (short-term) meaningful change.
For the near future, several informants expressed doubt that any significant and meaningful change can be expected in the broad context of EPCs. Some, however, left open the potential for long-term change.

> **BG** The Bulgarian informant claims Bulgarian EPCs are sufficiently detailed and that there is a well-established practice. If changes happen, they would be connected to smart buildings indicators and digitization and simplifying the auditing requirements for individual buildings
>
> *"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, as it is unavoidable for us as well"*

> **BG** The Bulgarian informant added that EPC certification and licencing scheme will be preserved as they are because the existing system for licensing of the auditing companies and the certification of the EPC issuers are generally perceived to be strict and demanding.
>
> *"Many of the requirements that are perceived as 'future' in other countries, are already functional with us."*

EPCs should have greater presence in the value chain of the building.
Many informants pointed out that EPCs have not reached the full potential.

> **NL** The Dutch informant pointed out that EPCs could have a similar function as industrial energy-efficiency labelling for electrical appliances and equipment, particularly in the sector of prefabricated construction.
>
> *"Dutch government should keep the pressure on the use of energy performance certificates in steady continuous pace."*

EU-MS divide

EPCs purpose is to meet the requirements of EU.
Several experts argued, that the existing EPC schemes are firstly a tool for MS to fulfil their obligations to the EU and that this will continue to be their key function.

The EPCs should respect the national specifics.
Several experts expressed scepticism regarding the possibility of an EU wide comparable EPC scheme/model.

> **BG** The Bulgarian informant explicitly expressed satisfaction with the Bulgarian EPC scheme, saying it fits the national specifics well.
>
> *"My long-term experience in implementation of EU policies and practice 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."*

Expert-user divide

EPCs are predominantly regarded an "administrative necessity".
This perspective on the existing EPC schemes is largely shared by both expert and general users of EPCs.

ES The Spanish representative of EPC scheme and guidelines developers stated that Existing EPCs are in practice hardly ever used in the iteration of the design phase and are untrustworthy. What is more, they are regarded as a final mandatory requirement without any added value.

"Due to the low consideration it has, simplified calculation options are favored, since they require fewer input data and are faster to be used."

"The simplified tools are mainly used, and they produce results which do not have great detail; therefore, they cause untrustworthiness".

The purpose of EPCs and certification schemes is in service of experts, *not* users.
Several informants argued that the purpose of EPCs is – and should remain – in service of the expertise.

SI The Slovenian informant stated that EPCs have practical value for experts and not for users, and argued that it should stay that way.

"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."

"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."

The value of existing EPCs for general users could be improved.
Although some experts believe EPCs are not meant to be used by general users, most experts believe that existing EPCs have potential for improvement in this respect.

HU The Hungarian informant stated that more information on possible measures could be helpful for end users. In the present status, the EPC has one page summary and has an annex with the calculations. The content of the annexed calculation tells nothing for non-expert users, but it is not the purpose of it, because that is primarily for experts. However, the one page summary is very short, the administrative data and the picture of the building takes half page. There are some indicators, which are hard to understand for non-experts, and there is a block of text about the energy saving measures, which is very short and not enough detailed.

RO In Romania, the existing EPC indicates the calculated energy consumption in standardised conditions and not real energy use or real costs. The information in EPC annexes is mostly very technical and can be interpreted only by users with technical background.

EPCs have minimal potential to influence people's behaviour.

SI The Slovenian informant believes that EPCs do not have considerable potential to influence people's behaviour or patterns of energy use.

RO The Romanian contributors believe, that even if the new EPC will indicate the pollution level (CO_2 equivalent emissions), it is hard to expect 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.

QUALITY

Method related

Inclusion of actual energy consumption can cause confusion in some cases.
Although many experts suggest including actual energy consumption indicators in the future EPCs, some experts claim this could have negative effects.

> **HU** The Hungarian informant claims that average of real energy consumption in the last 3 years is relevant, however especially in dwellings there can be differences in the use of the building, even the occupant can be different, therefore presenting the real energy consumption is not always more reliable than a common calculation method. The real energy consumption can be significantly different from the calculated figure. The inclusion of real energy consumption is rather justified in EPC of public buildings and in big buildings. The presentation of the real energy consumption in the EPC can be an added value, but explanation part is necessary to justify the difference between calculated and real energy consumption, which significantly increases the effort of EPC issuers and consequently the EPC's costs.

System related

Systemic changes are hard to implement.
Several informants also stated that government and EU-regulated systems and schemes are hard to influence or change. This has a significant negative effect on engagement of individual motivated supporters of the EPC concept.

> **SI** The Slovenian informant stated that in Slovenia "nothing can be done properly" and that all developments regarding EPCs and EU-related (and financed) policies depend on partial interests and relations between individual stakeholders. His stance implies a deeper structural and systematic challenge that have a considerable impact on its results, although transcending the scope and focus of our project.

Expertise related

Criteria regarding competences and skills for EPC issuers should be improved.
Complaints regarding qualification of EPC issuers have been voiced by both experts and users of EPCs, importantly also by the EPC scheme and guideline developers.

> **NL** *"It is very important to pay attention in good training and certification of EP-assessors. An important part in reliable quality."*

> **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."*

Such critique, however, cannot be generalized across all of the EU states and regions. Some have already taken proactive steps to insure quality qualifications of EPC issuers.

> **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."*

USER EXPERIENCE AND UTILITY

EPCs need to be re-established as a vehicle of added value.
The original idea behind EPCs is to create value for everyone involved in the certification process. Various informants noted that this is often not the case with existing EPCs.

> **ES** *"In the industry, this goal is reached, the energy label is everywhere, on every product, it is constantly shown. Whereas in the building sector, the label, if it is present, is not advertised at all, since it also tends to be poor; very often, although it is the law, common practice makes that EPCs are not required when purchasing/selling a building."*

Value of EPCs tends to be measured predominantly in financial terms.

> **NL** The Dutch informant stated that in general, without a financial driver, the interest in energy labelling is very low in NL. The interest in energy labelling is very low especially for individual dwelling owners and tenants. Financial (subsidy) and legislative incentives by the Dutch government are the primary driver for change, but that also has to do with the speed that is required. Private sector developments are increasing rapidly as well, but a push from the Dutch government was required to speed up the process."

PUBLICITY

Promotion and marketing of EPC products and services should be funded systematically.

> **RO** The Romanian contributors noted that promotion and marketing of EPCs should be funded through the national investment programs for energy efficiency (with money coming from government or from EU institutions).

MISC

New business models and business start-ups – combined with government support – will be a key driver for smart energy savings.

> **NL** The Dutch informant referred to the US company Tesla that changed the market of electrical cars, which for a long time where not very popular. On the one hand, they made driving electric cars fun and interesting, on the other hand, they pushed for financial support from governments. Car emission, greenhouse gas reduction, energy savings and driving go hand in hand.

State-level interventions will affect the market positively with regard to transitioning towards energy efficient housing stock.

> **NL** Dutch contributors noted that Dutch office buildings must have Energy label C by 2023. With these goals, the Dutch government has a tool to realize its ambition on Climate goals in a broad perspective. It is also interesting for the private market, because the willingness of banks will decline if energy classes of office stock are too high (energy labels, D, E, F and G). Banks will be less likely to lean money for Label D and higher buildings. This will be one of the causes the value of high label real estate portfolios to drop, etc. This causes investors in real estate to improve their portfolios.

Needs

PURPOSE & CONTENT

EU-MS divide

Establishment of national database.
Several experts, including EPC scheme and guidelines developers, suggested that the EPCs serve as a tool for gathering information about the condition of the national building stock. With this regard, some have suggested that gathered information should serve as a tool to establish a national database of the national building stock.

Expert-user divide

Rationalize EPC issuing costs.

RO The Romanian contributors suggested that the number of pages allocated to an EPC and its annexes should be kept as low as possible in order to reduce the printing cost of the EPC.

QUALITY

Method related

EPCs across the EU should be based on comparative standards.

NL The Dutch informant stated it is a good development that NL will change different methods into one calculation method (NEN; NTA8800) from next January 2021. The new method is largely based on the CEN Energy performance of buildings standards (especially building related, for installation still Dutch standards being used).

"In the newly introduced EP-system in the Netherlands from 2021 we expect a better way of benchmarking, because the new EP calculation method (acc. NEN-NTA8800) has been developed with one calculation/software kernel for all types of building. Not only for the public market but especially for the private market this creates a uniform way of benchmarking, instead of comparing current different methods."

RO The new Romanian calculation methodology will be almost 100% based on CEN EPB standards. However, the missing hourly climatic data will force the use of monthly calculation procedure.

Apply different standards of certification depending on the size and purpose of the buildings.
Several experts suggested that there should be distinction between certification standards for large buildings and facilities on the one hand, and small buildings or building units (individual homeowners, simple households, …) on the other. In this respect, the role of purpose of use as well as user habits and practices become obvious. Some suggestions include:

- More generalized EPCs for dwellings,
- More specific (complex) EPCs for public buildings and large facilities,
- Introduction of sub-rating indicators.

HU The Hungarian informant claims that complex EPCs are not justified for dwellings. In Hungary, 95% of the EPCs had been made for selling of a property. Therefore measured comfort

parameters and energy consumption won't be valid after the purchase, because those reflect the user habits. The new occupant may like to keep other comfort category, so the inclusion of the measured indoor temperature, etc. will be not relevant anymore for the new user of the building. Complex EPCs could, however, be useful for public buildings. For example, beside the energy certification pictogram, a new figure could be included which indicates the operation, the indoor temperature, settings of HVAC systems, etc. Beside the overall energy performance, some sub-rating can be also useful, such as building structures, heating, cooling, ventilation and lighting systems.

System related

Need for balance between cost and quality of EPC products and services.

Several experts pointed out, that the quality of EPC products and services is strongly related to their price. They argue that it should reflect the value of expertise required for its production. If the price is too low, the quality of services is likely to be proportionally lower. On the other hand, if the price is too high to justify the value it delivers, people will not support EPCs.

BG The Bulgarian informant believes the current Bulgarian system for quality assurance should be maintained, suggesting that attempts at lowering market prices could compromise the quality of existing systems. He does, however, suggest that simplified requirements for individual buildings could prompt lower prices and higher market acceptance

"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."

Transparent financial flows related with the project.

SI The Slovenian informant expressed concerns that there have been illegitimate practices involved handling the budgets for the policy implementation.

Systematic support for collaboration of business and expertise on such projects and less involvement of politics into the field of expertise.

SI The Slovenian informant expressed disagreement with the fact that political stakeholders involved in the process of first generation EPBD implementation in Slovenia denied support to involvement of certain private businesses.

EU member states should adopt already existing good practices to make their EPCs a starting point for renovations.

HU The Hungarian informant claims that the ultimate result of EPCs should be implementation of renovation measures. For this purpose, he suggests the following:

- A network of experts supporting EPC users interested in building renovations with advice on how to implement the measures suggested by the EPCs;

- Information on financing possibilities;
- The state should ensure a strong, reliable financing grant system to make building stock renovation process faster;
- Learn from best practices in this field used in countries such as Czech Republic and Germany.

Expertise related

Higher standards regarding qualifications of EPC issuers.
While the existing regulations and means of control tend to cover theoretical competences reasonably well, practice often plays out in contradiction to the established indicators. Following are several needs emerging from our research.

- Strict rules and regulations regarding eligibility for holding an EPC issuer licence.
- Improved education system, including continuous training in line with most current developments in the field.
- Active control of EPC issuers' competences and work both theoretically and practically.
- Control of the schemes' impact.

USER EXPERIENCE AND UTILITY

EPCs need to be user-friendly and user-centred.
Existing EPCs are largely expert oriented. Complexity of information and expert language included in the EPCs makes them incomprehensive for general users. In addition, information is presented in a way that general users find it hard to see any pragmatic use of the document. That diminishes effectiveness and value of both experts' work and the gross value-chain of EPC certification. Here are suggestions for potential improvements by the EPC scheme and guideline developers:

EPC product

- Design –

User-friendly EPCs.

- **Communicate meaningfully.** An Italian informant stated that value emerges from meaningful information linked with all aspects of sustainability.
- **Enhance reliability, ease of use, and convenience**. EPCs will encourage investments in high-performance buildings.
- **Better explanations and summaries for general users.** The Hungarian informant claims that one page summary dedicated to measures is not enough for lay people. One (or more) page is necessary in order to detail the suggested energy saving measures. One page for terms and definitions would be also helpful.

- Content and Utilities –

Include financial indicators.
Several informants suggested to include financial indicators as contextualization and illustration of the existing technical indicators, which are often overly abstract for general users to meaningfully understand.

> **ES** *"It may be interesting to include monetary indicators in order to get closer to what the final user understands (heating and cooling monthly/annual costs). However, some additional questions should be considered such as the energy price used for the calculations, the actual energy price*

varies hourly so the comparative may be difficult to make."

HU The Hungarian informant suggested the following indicators for financial categorisation of measures:

- **Investment cost:** low, medium, or high;
- **Expected return of investment:** short, medium, or long time;
- **Category:** suggested to implement if financial support exists.

He also claims that It is not necessary to include more financial information than suggested, because it would significantly increase the effort of EPC issuers and consequently the EPC's costs.

RO The Romanian contributors noted, that their new national EPCs will include financial indicators about the estimated investment related to the energy assessor proposals for the building (building unit) renovation.

EPC service

Provide systematic support for enhancing energy efficiency of the existing housing stock.

NL The Dutch informant claimed that financial (legislative) incentives (i.e. subsidies) are a key element to create strong support and success for EPC schemes in EU MS.

"Financial incentives will be the driver for future changes."

RO *"Clear legislation* [including heavy penalties for those not respecting it] *and norms are the main conditions to be fulfilled in order to obtain a successful EPC scheme."*

EPCs should include more connectivity and attractive features.

Several informants voiced expectations for improved capacity for interaction between EPCs and users, aiming specifically for effective promotion of actions for improving energy efficiency of buildings.

ES *"Introducing gamification features in the EPC. For instance, with users trying to reach the design conditions, integrating the bills with the EPC in some way would be interesting".*

PUBLICITY

Positive publicity.

An active communication campaign is needed to improve the awareness of the end users for the benefits of the building renovation, and hence, to increase demand for related services, including EPCs.

BG *"In all countries, there is one prevailing problem – the lack of awareness and market demand. This is why I really support the prioritization of the communication activities. 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."*

RO The Romanian contributors noted public or local investment programs for renovation as being the best promotion of/for the EPCs.

MISC

Need for a change and consideration of established cultural practices.
Socio-cultural practices, such as "self-build culture" in Slovenia or the "low renting culture" in Spain affect the construction and renovation sector of economy. Concrete actions should be taken to acknowledge such factors and to meaningfully address them through progressive policies.

> **ES** *"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. There would be more changes, and more exigence due to the lessons learned. Take, for instance, the automotive sector. People change car very often during a lifetime, and usually every change comes with greater efficiency".*

Public authority representatives

Key role: Responsible for policy implementation.
Key motive/interest: Functional realisation of EU directives**.**
Key insights: Systemic overview of EPC scheme development and implementation**.**

People responsible for the implementation of policies related with EPBD and EPCs on the theoretical, operational, and policy levels. They should be understood firstly as strategy/project managers rather than experts in the relevant disciplinary fields related with energy performance of buildings. They coordinate the process of EPC scheme and guidelines development and ensure its realisation from its political to its operational level. They typically have good background in technical knowledge and often act as facility managers at regional or national levels. In contrast to the EPC issuers or profiles included in the EPC Users chapter, they often lack insight into how EPCs are received by people in practice.

U-CERT reference ● *Lack information about how policy measures are impacting the actual performance of buildings and how to tune the assessment processes and certificates to have a maximum impact.*

Limited trust about EPC in relation to real energy costs/use. Evidence-based decision-making. U-CERT aims at maximizing the usability of the EPCs databases for policy makers, to enable them to monitor and use the databases for the preparation or tuning of the policy measures, e.g. aiming at accelerating effective deep renovation.

Informants' background by countries ●

BG Municipal energy manager with more than 15 years of practice.

EE National building registry expert, project lead.

ES #1 Head of a key regional level institution involved in development, implementation and supervision of EPC schemes.

#2 Public authority representative with close knowledge to professional perception.

#3 Public authority representative with close knowledge to user and professional perception. Highly active in social awareness campaigns.

FR Referent councillor for the energy information space in a conurbation.

HU Representatives of Ministry of Innovation and Technology responsible for development and implementation of EPBD.

NL Senior policy officer at the Ministry of internal affairs

RO Two representatives of the Ministry for Public Works, Development and Administration.

SI Head of a key state level institution involved in development and implementation of EPBD.

SE #1 Project manager/engineer at National Board of Housing, Building and Planning (Ministry of Finance).

#2 Senior expert/consultant for public authorities (National Board of Housing, Building and Planning, Swedish Energy Agency).

#3 Senior expert/former project manager at Swedish Energy Agency.

Expectations

PURPOSE & CONTENT

General statements

EPCs have significant potential and their value will be fully developed in the future.
Several public authority representatives have stated that EPCs have a significant potential value, even if generally they are viewed otherwise. However, time is required for the policy to develop its full potential after implementation. Some believe that the value will be reached in the following years.

> **ES** *"EPCs need time. In the case of appliances (the interviewee's administration also manages appliances renovation plans), it took about 10 years for energy labels to fully establish in the market. Regarding EPCs in Spain, although it is true that for new buildings, EPCs became mandatory in 2007, for the existing buildings it was not until 2013. There is still time ahead, though it is more and more common to see advertisements of new developments with A energy labels".*
>
> **HU** The Hungarian informant claims original purposes of EPC are only partially fulfilled. The labelling itself and expressing whether the building is good or not 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.
>
> **RO** The Romanian informants explained, that their new national EPC, introduced some time by the end of the year 2020, will provide all new elements stated by the last EPB directive, transposed into national legislation. That includes investment price (financial indicator), sources of funding, return on the investment, and even information if the building is nZEB or the value of the optional indicator SRI.

Some experts believe their countries have already developed their EPC schemes to the optimal capacity.

> **BG** In case of Bulgaria, several experts argued that the quality of the existing energy audits and EPCs is generally good, and it will remain the same. The Bulgarian informant believes that the existing EPCs are sufficiently detailed and strict, the licensing regime of the energy auditing companies is an efficient tool for quality assurance and control, and that under the established practice the existing scheme is unlikely to significantly change in the short-term.
>
> *"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."*
>
> *"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."*

The 2nd generation EPCs will be widely accepted faster and more efficiently than the 1st generation.
Informants widely agree that future EPCs should build upon knowledge and experiences from the previous existing generation of EPCs.

> **SI** The Slovenian informant pointed out that the ultimate tool to ensure wide "acceptancy" is enshrining EPBD directives in law.

> *"You issue a law and it becomes widely excepted. /…/ Or to answer the other way around, if we didn't have it written in the* [EPBD] *directive, we would never have implemented this* [the 1st generation EPC scheme]*."*

SI A public service rep. from Slovenia stated that that the 2nd generation EPCs (or changes to the existing EPC schemes) will be widely accepted much faster and implemented more efficiently than the 1st generation. The concept of EPCs is already known to all stakeholders – both experts and the users – which will make changes easier to introduce. In other words, the 1st generation EPCs prepared the ground for the uptake of the following generation.

SE The Swedish informants pointed out, that their EPC system has been continuously developed/improved since its implementation. It seems that now the time is right to have a more thorough look at the EPC system in a holistic way (total overview) and assess what parts need to be further developed, because the ideas were very good when it started. Now, however, there is also gained experience available. The first step should be to identify the problems and then come up with a solution.

RO *"The new EPC should be more reliable, more user-friendly, more informative, more easier and faster to issue, even if the calculation procedure is much more complex."*

Existing EPCs fail to motivate users and are generally perceived as an "administrative necessity".
Several experts pointed out lack of interest and motivation of users to engage with the existing EPCs. One of the main explanations is, that they are considered first and foremost as an "administrative necessity" and that as such they offer little to no value.

HU The Hungarian informant claimed that people only have EPC made in mandatory cases, such as real estate selling or renting, or for 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.

RO Romanian contributors noted the possibility of change in their fiscal legislation in order to motivate the use and positive attitudes towards the EPCs. They anticipate some (local and/or national level) taxes exemptions for buildings in class A+, A and even B (energy and/or CO_2 equivalent emissions), which is expected to positively motivate users to ask EPCs not only for ruled situations (sales, rent, works reception). They also note, however, that such legislative transformation needs political willingness, which is very difficult to foresee.

The next generation EPCs – combined with progressive state or reginal-level policies – are expected to trigger more renovation actions.

ES A rep. from Spain commented that in Spain renovation rate needs to be improved and that EPCs have a potential role in this process.

> *"One possible way of solving it would be giving more subsidies, which could be complemented at local level (currently the Ministry and the Valencian Regional Government do give many subsidies towards energy efficiency in buildings). These new measures could be designed in a way they motivated energy renovation actions. For instance, is an intervention is to take place in a building with poor energy label, some taxes could be bonified (construction tax ICIO, waste management tax...) or made exempt. Moreover, the yearly building tax (IBI) could be linked with the EPC, being reduced if the EPC has a certain quality level."*
>
> *"For the user, there may be some parts of the EPC report harder to understand,*

but the final user should focus on the coloured label and the annex of Energy Saving Measured (ESM). This annex could be made more user-friendly, since it has a lot of information which is not directly useful for the user (building characterization, consumption reduction…). The energy label, since it uses similar aesthetics as the labels for the appliances, it is visual and understandable by the users".

EU-MS divide

The concept of EPCs will evolve to address needs beyond the context of nation states.

SI The Slovenian informant claimed that the future of EPCs are likely to transcend the existing concept and create some sort of "holistic sustainable building certificate" accounting for wider contexts of EU and even the world as a whole. Such transition will also include new concepts and contents, such as:

- life cycle cost,
- human-building interaction,
- sustainable resources and technologies etc.

EU institutions should provide universal tools and methodologies for highly comparable certification schemes and used across the EU.

Several informants argued that shared EU-led software tools and calculation methodologies would be very beneficial for the overall quality of EPC schemes across the EU. Key strengths of such tools and methodologies should be:

- Comparability

  SI *"It is true that in the globalised world, wide connections, especially with multiple-occupant buildings, there should not be many differences. Because, if there is a bank being built at our side of the border or in Austria… that also the EPCs are comparable… because also the companies do business across the border".*
- Universality

  RO Romanian contributors pointed out the use of new set of EPB standards from CEN, taking into account the normative annex A (adaptation for each EU country).
- Adaptability

  NL Dutch contributors summarized their informant's opinion, saying that EU that fit with their requirements and goals of EU policy should be revised and synchronised.

  "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."

Expert-user divide

Purpose of EPCs is to decarbonize the EU building stock by 2050.

HU The Hungarian informant pointed out that the overall goal of the EU wide push for EPC schemes is to achieve decarbonised building stock by 2050. In his opinion future EPCs shall provide information not only for end-users, but also – or perhaps most importantly – for experts and policy makers. EPCs of the building stock presents basic data for experts and policy makers. The EPCs contain essential data necessary to develop programs and strategies to improve energy performance of building stock. They have to see what kind of renovations have been implemented and what the results are and how the building construction sector has been evolving. 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.

QUALITY

Method related

The EPC's purpose needs further information campaigns.

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.

System related

Quality control will improve.

Public authority rep's claim that quality control of both issuers' work and issued EPCs will be improved significantly under the forthcoming policy implementation. Some measures to secure such developments include:

- Improved software tools for EPC calculations,
- Fieldwork checks,
- Financial penalties for individuals and institutions who do not follow the regulation (avoid certification),
- Revoked licences for issuers who do not comply with or meet the quality standards,
- Enhanced communication with users (looking for reports on possible issues with the established system),
- Establishing feedback loops for improvement of certification services (such as educational processes and contents),
- Mandatory periodic training for certified EPC issuers (updates on novelties on the market, changes in EPC methodologies, exchange of knowledge and practices etc.),
- Capitalizing on knowledge and experience gained during the past years and across the EU.

Expertise related

It is not only the EPC issuers, changes are needed in several areas.

Several informants pointed out, that is not enough to only push EPC issuers to propose better measures. Motivation of end-users and the development of the methodology are just as important. Hence, the steps of necessary changes have to be harmonized and planned carefully.

The EPC issuers' suggestions for improvement of buildings' energy performance are questionable.

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.

USER EXPERIENCE AND UTILITY

EPC product

Non-expert users find most of the EPC hard or impossible to understand.
Several experts acknowledged the fact, that existing form of EPC is hard to understand for the vast majority of general users, majority of which have little or no relevant background knowledge.

> **HU** The Hungarian informant pointed out, that non-expert users probably understand the labelling (A, B, C, etc.), which is good for comparing buildings, so a non-expert is able to select the better building. They also understand the proposed measures, but nothing else. It would be good to present the main results in simple sentences for them.

> **SE** Swedish contributors note, that at the existing EPC report is quite "dry", including only tables and numbers. Hence, even if people are interested in the content, it is not easy for them to understand or to use it. This is why people see it primarily as cost, and fail to capture – or realize – its full value.

One-size-fits-all EPCs are not efficient.
Several experts expressed doubts about the fact, that existing EPCs are designed as a universal document intended to communicate meaningfully and efficiently to both experts and users with different levels of knowledge and interest in the broad context of EPCs.

> **NL** The Dutch informant pointed out that using a communication bureau and focus groups, etc. will not make for a user-friendly certificate if we don't look critically at the indicators and information that is now demanded by the EU to put on the label. The equation is also: can the different goals we have with the certificate be met by one and the same document: different stakeholders need different information, and the same stakeholder group need different information in different phases. Making a one-size-fits-all certificate might just be impossible, even with the best communication advisors and co-creation processes.

PUBLICITY

There is a sense of general lack or insufficient promotion and marketing of EPC products and services.

> **RO** Romanian contributors noted that there is no public or local promotional campaign for using EPCs as a renovating tool in their country. The EPCs are issued only if the EPB low asked for it or if the buildings are involved in a national funding program for energy efficiency.

Needs

PURPOSE & CONTENT

General statements

Review the purpose of EPCs and clearly define its limits and potentials.
EPCs shouldn't attempt to capture and solve all questions and problems by itself. Perceived value of the EPC is only as good as the foundation it is based upon.

> **EE** As the Estonian informants argued – let's not try to solve all problems with EPCs in cases when there are other means and actions better suited for finding appropriate solutions.

> **SE** EPCs collect a lot data, which is not presented in the existing EPCs in an "accessible" way for the users. The information shared in the EPC report overall needs to be easier to understand and presented in a user-friendly manner, "translated" into the common language understandable to non-experts. In this way, people will be able to capture more of its value.

QUALITY

Method related

Need for universal EPC tools and methodologies with capacity for application across the EU.
That will ensure comparability and provide ground for efficient uptake of policies on member-states level.

> **NL** The Dutch informant claimed that using the CEN standards for the certificate is good, however, the realization of standards should be wider than simply aiming at ensuring all new buildings to have a certain energy performance level. EPC goals in relation to CEN should be clearly defined. With the existing EPCs, the CEN standards and related goals are vaguely defined.

The new EPC schemes should have the capacity to accommodate change.
That includes openness to innovation and capacity to accommodate specificities of MS regarding both software tools and methodologies.

> **ES** A rep. from Spain noted that calculation tools are often overrun by constant market development and innovation.
>
> > *"The problem is that the tools are not updated very often… New design strategies, bioclimatic elements, new technical systems are developed, and they cannot be introduced in the existing tools."*

The new EPC should include or provide access to information about the building's structural strength (seismic assessment) and the fire protection measures (where needed).

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

System related

Need for an interconnected system of support, guidance and engagement.
Public authority rep's voiced the need for:

- Strong systematic support and guidance from EU institutions,
- Support and engagement from the Enegy performance of buildings expert community,
- Actively involve key stakeholders, such as real-estate market players,
- And systematic engagement of users in the process of certification.

For public authority rep's and other strongly invested individuals at the forefront of policy development and implementation lack of cooperation from stakeholders can be very frustrating and discouraging.

> **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."*

Improvement and refining of building registry entries.
Registry databases are a valuable tool for capturing information about the whole building stock. However, several informants pointed out that to improve the dataset related with energy performance of housing stock, a more widespread and better certification of existing housing stock is needed.

> **ES** A rep. from Spain commented that for policy development, there is a great void of information regarding EPCs in existing buildings.
>
> *"This is caused by the fact that private buildings which are not sold/rented or do not ask for subsidies of any kind are not required to issue an EPC, therefore they are not analysed. One way to solve them could be to require the EPC in more administrative procedures; for instance, when asking for building permit (at municipality level)".*

> **EE** On a similar note, the Estonian informant pointed out that some data points are currently not captured for registry-wide queries but are rather present only in appended documents. As a step towards a potential solution, he suggested implementation of "dynamic data" – integrating metered data from heating/electricity grid providers for real-time overview and queries.

Need for an efficient and robust validation methodologies as well as quality control.
Public authority rep's recognize the shortcomings of the existing EPCs regarding quality control. Poor quality control has an indirect impact on aspects of reliability, comparability, efficiency and acceptability of EPC schemes.

To ensure credibility and reliability of EPCs, we need efficient and robust methodology for:

- Testing the quality of issuers' work,
- Testing the quality of EPCs as derivatives of established methodologies and tools,
- Validation of technical performance of new technologies before integrating them into the EPC scheme,
- Ensuring reliability of input parameters, and
- Narrowing the gap between the calculated values and actual performance of the building.

Finally, an efficient administrative system with capacity to moderate necessary processes and maintain standards is needed.

> **ES** *"There is a need of having constant updates, at least on the detailed tools. This will be*

beneficial to the building sector, like other documents which are updated yearly, the construction price database for instance. This constant update should be enhanced by the public administration with power over it, the Industry Ministry."

ES *"The public administration could also favour the use of detailed tools rather than simplified ones, by stating it as a requirement for public contracts or subsidies."*

To accelerate renovations, tools and mandatory requirements could be introduced.

HU The Hungarian informant gave two examples.

- Frist, in Great Britain and some other countries they started to introduce a condition for leasing a property, so it has to be achieved a certain energy performance.
- Second, 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.

The suggestions for improvement need to be contextual.

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.

Expertise related

More emphasis on highly qualified EPC issuers and public recognition of their work.
Several rep's commented, that the general pool of EPC issuers is either under-qualified or poorly motivated to perform precise calculations. This creates an environment in which EPCs are an end in itself, delivering poor value for both users and experts.

ES *"The reality of EPCs is that they are not very reliable, because they are often calculated in a quick and poorly manner. This is mainly caused by the fact that architects and engineers see the EPC as another field of work, which is not very valued by the final client. Therefore, not a lot of time is spent on calculating it. If there were more training on energy diagnosis this trend might change. 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."*

The financial cost of EPCs and value they provide to all stakeholders needs to be balanced.
Several public authority rep. believe that the issuing price of existing EPCs is too low, which has detrimental effect on the certification scheme as a whole.

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

ES The EPC market is based in a very low-cost fee offer that undervalues the possibilities of the energy studies that are performed when the document is required. This is due to the characteristics of the simplified simulation software approved by the government and to what the market demands from the document, which is just an administrative procedure.

NL The Dutch informant believes, that the "cost-effective" measures proposed by the existing Dutch EPCs are not *really* cost effective as they are "too generic".

USER EXPERIENCE AND UTILITY

EPCs need to be user-friendly and user-centred.
Existing EPCs are largely expert oriented. Complexity of information and expert language included in the EPCs makes them incomprehensive for general users. In addition, information is presented in a way that general users find it hard to see any pragmatic use of the document. That diminishes effectiveness and value of both experts' work and the gross value-chain of EPC certification. Here are suggestions for potential improvements by the public authority rep's:

EPC product

- Design -

- **Better design and layout (user interface) of EPCs.** That includes improving their graphic (visual) impact as well as addressing the complex technical terminology (using keys, glossary of term, easy connections to additional information etc).

  NL The Dutch informant gives an example of difficulties they faced trying to follow the EU's aim for raising consumer awareness.

  "The simplified label we developed in the Netherlands is able to do this: a rough indication if the house is 'good' (green) of 'poor' (red). However, the requirements from the EU seem to collide: the simple method had to be withdrawn, since another requirement is to use kWh/m2 as an indication, and for such a simplified awareness-raiser that did not work." (Paraphrased by Dutch contributors)
- **EPCs should offer various modes of presentation for different levels of knowledge and needs.** The Estonian informant pointed out that EPC calculation procedures are complicated. As several other experts across the EU, he argued that the next generation EPCs should provide various modes of complexity of presented information. General users should be presented with simplified information, while finer detail should be available on the expert level, as they are the ones who can interpret it meaningfully.
- **For general users, build upon simple graphic representations.** The Estonian informant claimed that current implementation of colour-based letter grading has a value of its own in its simplicity. In his experience, the end-user fails to understand a unit such as kWh/m2y, especially with primary energy calculations, while colourful categorisation is much more efficient in communicating the key information.
- **EPCs should provide relevant information with transparent referencing.** EPCs tend to present data and information in a format that is hard to understand and sometimes, as suggested by the French informant, suggest inadequate measures. In their opinion, EPCs should also provide less information in order to simplify the reading and avoid misunderstanding.

  NL The Dutch informant comments on the EU's preferred use of kWh/m2 as a reference unit for EPCs, arguing that consumers do not actually understand it.

  "They think that this is his own energy use, but it isn't! The certificate should communicate a simple message are you living in a poor house (red) or is your house rather good (green). The fine-tuning, which is done now, is fake accuracy: it gives the impression that a very accurate assessment is done, while many of the standard assumptions and average values used are far from the real situation."
- **EPCs should offer "easy access" information** based on the technical indicators to make end users understand the real potential of the document and determine a renovation roadmap or inform about the current Energy performance of the property.

- Content and Utilities –

EPCs need to deliver pragmatic value for their users.
Several public authority rep's argued that EPCs should be a convenient and reliable way for buyers and owners to access formal and independent expert's opinion regarding energy performance of a building/housing unit including possible investments and measures to improve their performance.

Need for Explicit information regarding the condition or absence of building's systems.

> **ES** The Spanish report notes that users do not understand the concept of "assumed system" used in the EPC calculation. That could easily be changed in the benefit users' perception of EPCs by more contextualization and illustration with practical everyday concepts, which are closer to general users.
>
> > *"One important aspect will be to include the explicit note that when the building lacks heating and cooling systems, that EPCs are calculated with a reference technical system. This will make clear some doubts final users have when the EPCs shows consumption in, for instance, cooling, but they do not have any air-conditioning system."*

EPCs need to integrate indicators related to sustainability and ecology in buildings.
The major challenge for the future EPCs is to make users aware of their energy-related climate impacts. Several rep's pointed out that the existing EPCs – while able to present the energy efficiency level of a building or property – still need to evolve to include sustainability indicators about building's material qualities, such as LCA, and SRI. Several informants believe EPCs should explicitly promote (end educate on) the importance of human-building interaction. A good system supporting both user and system feedback could efficiently anticipate and avoid over-consumption.

SRI introduction is a positive development but still a long way away.

> **HU** The Hungarian informant claimed it is clear that not every EPC issuer 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 it is not decided yet in Hungary, when and how to introduce SRI certification.

Integrate EPCs with digital technologies for improved interactivity.
Digital technologies enable countless options. However, oversaturation with the digital should be considered as potential threat to success of solutions, such as mobile apps.

> **ES** *"Regarding the final users, maybe some kind of app which could digest all the information in the EPC and provide a detailed explanation of each of the ESM could also be beneficial. However, with the excess of existing apps it may not be used very much. Also, the development of this app would be costly, and it should be managed as well. Maybe the energy companies would find it beneficial, trying to link the EPC with the bills, or provide customized offers through that channel".*
>
> **ES** *"EPCs may not be ready to define any kind of technology. It is the responsibility of the manufacturers to adopt their solutions to have the format to be implemented in the EPCs".*
>
> **SE** Having interactive (digitalised) access to your buildings EPC is a key element. It would be very valuable not only to see the current performance, but play on your own with what if scenarios (what if I make this and/or that improvement…). What if scenarios were possible before introducing primary energy factors (easy to do some calculations by hand), however now it's complex and it takes an engineer. This approach would create a good tool to regain this value lost by building owners.

RO The Romanian contributors stated, that a new law regulating the EPC scheme in Romania, which requires the use of electronic signature used by energy assessors, will help the digitalisation process in the field of energy performance of buildings. In addition, the envisaged application for automated official registration of EPCs in the national database will ease and speed up the entire process.

Review the content included in the EPCs.

Several informants pointed out that certain elements of the existing EPCs are useful and necessary, while other might have to be added or left out. In the Hungarian case, the informants suggested to keep the asset rating, while indicators of real energy consumption would also be a useful addition to the EPCs.

HU In Hungary, the asset rating has been in force from the beginning of the implementation of the EPBD. The asset rating evaluates the building itself objectively, while the operational rating evaluates not only the building but also the people (how they use the building, what preferences they have, etc.), so it is not sure this operational rating is that we should expect from EPCs. However, it is a debate how the calculated energy use can be brought closer to the real energy consumption, and what could be the reason of the difference between calculated and measured figures. So, it could be a good way of development of EPCs, that even the measured figures do not form the basis of the rating, but indeed the explanation of the gap between the calculated and the measured figures should be included in the EPC and based on that such measures can be proposed which is in connection with the operation of the building. Similarly, the calculated and the real energy consumption can be different, because EPC does not contain all energy consumers. However, it should be expected to present other main reasons in the EPC, such as method of use, level of technological obsolescence, etc.

PUBLICITY

More positive publicity for EPCs.

Several public authority rep's noted that promotion and marketing importantly affect the overall public image of EPCs. In cases where promotion has been poor or negative, EPCs tends to be poorly represented or even negatively perceived. This suggests it is very important the new generation of EPCs is accompanied by a push for positive publicity. Such efforts should be orchestrated by the governing authorities (policy implementers) and involve reliable experts in the field of EPCs, reputable (public) institutions and potentially visible public figures as ambassadors or advocates of the scheme.

SI In Slovenia, negative publicity has proven as an issue regarding public attitude towards the policy, which persists to this day.

ES *"Some more actions could be having more communication, or increasing the frequency of the existing in TV, press, mass media, etc. For instance, at the beginning of the summer (when many air-conditioning installations take place) the benefits of having an overall diagnosis of the building by means of an EPC could be advertised".*

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.

MISC

No need for further assistance.

BG The Bulgarian informant claimed that the existing EPCs are sufficiently user-friendly and perform their functions both as static information and as tool for monitoring and maintenance of the building performance.

"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 I format, and in general."

"We as a municipality take into account the measures prescribed in the certificate. I personally have the obligation to check if these measures are executed properly and if the building is maintained properly."

Product manufacturers & product and service suppliers

Key role: Policy influencers.
Key motive/interest: Mitigate the impact of policies on the industry and market (protects business interests).
Key insights: Industry's viewpoint on opportunities and challenges of EPBD related policies.

Manufacturers and suppliers of products and services related with energy performance of buildings. They have a direct and indirect impact on the energy performance of buildings and a business interest in private investment in ambitious renovation projects. As such, they are an important stakeholder in the process of EPBD realisation. They are likely to have a good insight into the practical qualities and value of EPCs in the market context on levels of MS and beyond. Also, they are a good reference for understanding the relation between private and public spheres of shared goals and conflicting interests.

U-CERT reference ● *Manufacturers of products used in buildings having an impact on the Energy Performance of Buildings and their systems, are required to declare relevant product information according to the rules and requirements for energy labelling and ecodesign. The data included in these product declarations (labels) are in many cases insufficient or not directly useable as input value for the Energy performance of buildings calculation procedures as included in the set of Energy performance of buildings standards and in future national annexes.*

They have the need for unambiguous and proper assessment procedures for rewarding the real performances of new, innovative products and services and the possibility to transform product information (and measured performances) into suitable input for energy calculation.

Informants' background by countries:

BG Building certifier, airtightness tester, very experienced and qualified energy consultant.

ES Sales and systems specifier for a major company of Ventilation Systems.

HU Representative of a successful product and service supplier company.

NL Senior product manager at a manufacturer.

SI Sales and Energy Management Director for a major SI energy and ESCO company.

Expectations

PURPOSE & CONTENT

General statements

Experts and users have varied understanding of the purpose of EPCs.
Although most viewpoints regarding the purpose of EPCs involve energy, buildings and efficiency, there are numerous nuances to how the exact purpose is described.

> **NL** The Dutch informant claims the aim of the EPC scheme is that in the end buildings will become energy neutral.

Professionals generally support the development of the EPC.
Most expert informants and informants with professions related to the wide field of EPCs expressed general support for development of EPC schemes.

> **HU** *"In my opinion, the professional side supports the development of the EPC. In my opinion, no particular patterns of use can be observed among end-users, they perceive EPC as an administrative necessity. End-users would support the development of the EPC, in the case if they knew that the data in the certification would appear in a way that could be interpreted and used by them."*

The existing EPCs is unlikely to significantly change in the short-term.

> **BG** In contrast to some high-level experts responsible for development, implementation and maintenance of the existing EPC scheme in Bulgaria, the rep. of service suppliers argues that the existing Bulgarian EPC scheme is in need of change. Nonetheless, he believes no relevant change is going to happen in the foreseeing future due to political and administrative barriers.
>
> *"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."*
>
> *"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."*

QUALITY

Method related

Actual (measured) performance is more reliable than the calculation.
Several informants elaborated on the difference between measured and calculated EPCs.

> **NL** The Dutch manufacturer stated that if the EP calculation would be simpler, products would be rated much more fair, meaning small details would not lead to large differences in rating. However, based in the argument to keep things simple, the use of default values is promoted, says the manufacturer. This results sometimes in the opposite effect, namely that differences between products are not taken into account, which also isn't fair. Hence, it is better if the actual performance is taken into account.

The idea of comparability of EPCs has more difficulties than potential.

SI The Slovenian informant commented that there are simply too many variables. From finding energy providers, to the source of energy you will use, to the moment in time when you are buying it etc.

USER EXPERIENCE AND UTILITY

EPC product

- Design –

More user-friendly features and more specific information would be a positive development.
Several experts pointed out, that user-friendliness of the existing EPCs is poor.

HU The Hungarian informant claimed that presentation of data important to the user could be a bit more "colourful". More graphics would also help the understanding. More specific information would help to use the EPC's results in the renovation process:

"The heating and cooling capacity demand of the given building could be presented, which would help the request/quotation in case of development of the heating and cooling system."

- Content and Utilities –

SRI and digitalisation.
Several informants expect SRI and digitalization to be an integral part of the next generation EPC scheme. However, none of the product and service suppliers voiced such a view.

SI In contrast to the general opinion, the Slovenian informant claimed that developments in that direction are not yet viable.

"Interesting question. That it [SRI] *would be part of EPC, I don't think so. /…/ Digitalisation 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."*

Influencing practices and behaviours via EPCs is not going to be easy.
People will not be prepared to give up comfort, conveniences and habits they enjoy. In relation to question of interactivity and potential impact of EPCs on user behaviour (by means of SRI), the Slovenian informant stated that people do not like to change their habits and practices.

PUBLICITY

Lack of awareness negatively affects demand for EPCs.

BG The Bulgarian informant attributed lack of demand for EPC services to the generally low levels of awareness of the benefits of energy efficiency among professionals working in the relevant fields of expertise.

"People are only interested if it is legally required, they are not interested in energy efficiency in general."

Needs

QUALITY

Method related

Need for new methods and approaches to analyse Energy performance of buildings and present results as meaningful information for all stakeholders.
Several product and service providers claim that potentials for improvement of EPCs are clear.

> **BG** The Bulgarian informant claimed that the existing calculation methodology had deficiencies and needs to be improved in line with the current technological advances. He also points out, that there is disagreement among experts in Bulgaria whether changes or improvements are actually necessary.
>
> > *"I would say that it's 50:50: the people who are dealing seriously with energy efficiency think that they are not good enough, people who are not so serious are satisfied."*
>
> **ES** Similarly the Spanish informant claimed that what is needed are "concrete 21st century solutions" that have the capacity for wide application and address the needs of the building stock and their users.

Some of their suggestions include:

- integration of new (digital) technologies,
- examples of good practices,
- continuous (real-time) monitoring.

System related

Better quality control.
Several informants have emphasized lack of quality control as the core issue of the existing EPC schemes.

> **ES** "*There is no quality control of the EPC what makes it less reliable that it should be. The regulatory framework around it should include a quality assessment protocol to guarantee the consistency of the document and its reliability."*
>
> **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."*

The financial cost of EPCs and value they provide to all stakeholders needs to be balanced.

> **ES** A product and service provider from Spain claimed that it is necessary to review the market fees when producing the document as its low rates have repercussions on the quality of the process and the resulting EPC.

USER EXPERIENCE AND UTILITY

EPCs need to be user-friendly and user-centred.
Existing EPCs are largely expert oriented. Complexity of information and expert language included in the EPCs makes them incomprehensive for general users. In addition, information is presented in a way that general users find it hard to see any pragmatic use of the document. That diminishes effectiveness and value

of both experts' work and the gross value-chain of EPC certification. Here are suggestions for potential improvements by rep's of product manufacturers and service suppliers:

EPC product

- Design –

- **Better overall design**. That involves better graphic design and intuitive easy-to-understand indicators related to aspects of comfort, finances, SRI etc.
- **Inclusive language for non-experts**.
- **Build on visualization.** The Dutch informant claims that *"if you make it really visible if the performance is good or not, that that would be a call for action."* In addition, he stated that performance monitoring would be very helpful to determinate efficacy of introduced measures.
- **More than a bureaucratic procedure.** Several informants claimed it is clear that EPCs have a potential value for all stakeholders involved in the certification process, but as long as it will not have qualities to deliver that value, EPCs will remain to be seen as an administrative necessity.
- **A clearly defined Renovation roadmap.** An informant from Spain suggested that Renovation roadmap would be an essential element of EPCs to transparently present the impact of the energy renovation measures prescribed by the expert using quantifiable and comprehensive indicators.

HU The Hungarian informant stated that making the EPC as starting point of the renovation needs presenting data necessary for designing of (deep) renovation projects. 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.

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

- Content and Utilities –

Improvements in content quality of EPCs.

Informants believe there is significant potential for improvement of EPC content. Here are some of the highlighted aspects:

- **Improved quality of input parameters.** Criteria for the new generation of EPCs should be more ambitious and practically oriented, including aspects of comfort, economics and LCA indicators.
- **EPCs as a basic renovation guide.** A Spanish informant claimed that EPCs should include a roadmap towards higher energy performance.
- **Continuous (real-time) monitoring.** Informant from Slovenia claimed that existing calculated EPCs are rather straightforward and with little potentials for improvement. Measured, however, could be upgraded by continuous readings. Informant added that their company was considering offering service of continuous monitoring of energy performance, which would provide yearly updates on Energy performance of buildings for (in their case) public buildings through a bespoke monitor, platform or application.
- **Integrate EPCs with educational elements**. Informants claim that people should be educated about aspects of human-building interaction and energy performance of buildings. Some argued that such content would ideally be taught as early as in primary schools. Certainly, however, there should be a meaningful integration of educational elements in the EPC schemes.

Include minimum IEQ standards into the EPCs.

Several informants pointed out that EPCs should also refer to qualities beyond energy performance. In the light of aspirations for holistic and contextualized EPCs, they should communicate clearly the purpose of Energy performance of buildings concept and demonstrate both its potentials and limitations.

NL The Dutch informant claimed more rules to guarantee good IEQ and specifically indoor air quality are needed.

"The problem with indoor air quality is that you do not notice it. The label does not take care of this issue now, but we would like to see an indoor air quality indicator on the certificate. And it would be nice if there also would be a minimum quality demand in the legislation. There are already many of such indicators. User behaviour plays a role here too. But even as an indicative indicator for information purposes: that would already have a large effect."

For providers of products and services, EPCs need to be a reliable reference point.

Many experts, including product and service suppliers, believe that existing EPCs are simply an administrative necessity. They believe if the EPCs were to realize their purpose, they should have the following qualities:

- be an indicator based on a regulatory framework that guarantees reliable data and quality information,
- include both measured and calculated values of buildings' energy performance,
- possibly include real-time performance indicators.

Include financial indicators.

HU The Hungarian informant claimed that energy cost saving is interesting for everyone. The percentage of energy cost saving could appear for each development proposal, or taken into account a given energy price, this means exactly how much HUF the cost saving is. This should be presented and described with explanations and figures.

Independent controlling body representatives

Key role: Policy enforcer.
Key motive/interest: Delivering quality control services (business opportunity).
Key insights: The state of EPCs in practice; insight into balance of powers of the involved stakeholders.

Representatives of institutions responsible for control over effective implementation of national EPC schemes, quality of issued EPCs, and compliance with the relevant laws and regulations by all actors involved. They have a good insight into the state of EPCs in practice – quality of issued EPCs, general compliance with EPC scheme regulations etc. In addition, they tend to have a good overview over the interrelations of power – political connections, conflicts of interests etc.

U-CERT reference ● *New indicators will be introduced in the next generation EPC schemes. If complicated the certification process will require more human capacities to perform good quality control. Due to limited resources available the controlling bodies could not provide control to all certificates and the corresponding documentation.*

U-CERT Guidelines will steer and streamline the U-CERT support actions at national level for facilitating the national organizations responsible for the EPC scheme to evolve towards innovative EPCs.

Informants' background by countries ●

BG Head of direction of the responsible public authority.

EE Energy efficiency specialist in national controlling body.

ES Independent controlling body for EPCs at regional level, with additional expertise in issuing EPC, and also as building designer, facility manager and commissioner.

IT Professor.

HU Representatives of Ministry of Innovation and Technology, who is responsible for development and implementation of EPBD

NL Senior consultant/director of independent controlling body.

SI Head of a key state level institution involved in development and implementation of EPBD.

Expectations

PURPOSE & CONTENT

General statements

The Energy performance certificate is theoretical.

NL The Dutch contributors summarize their informant, saying that existing EPCs do not tell you what the real-life energy-use will be. And this is difficult to understand by users, sometimes even for the policy makers at the Dutch Ministry who are involved and responsible for implementing in NL. The newly introduced Energy certificate ("Energielabel") in the Netherlands makes this even worse, because it has an added indicator on "Energy costs". Even this is theoretical and connected to the determined label but NOT to use in practice.

Expert vs. user divide

EPCs are inherently associated with pragmatic financial logic.

NL In the Netherlands, the market for energy-efficient building and –saving is financially driven. When energy performance certificates are connected to financial instruments, you see added value. Like having an energy label as prerequisite for receiving subsidy or other grants when buildings are made more energy efficient.

QUALITY

Method related

Dynamic measured EPC solutions are the way of the future.

Based on their experience, experts claim that end-users are first and foremost interested in the running costs of the property. Although being valuable for experts, data with resolution longer than a month has little value for general users. In addition, prices on energy markets as well as general energy policies are changing at an accelerated pace. These are just some of the reasons why several experts pointed out that relevance of measured EPCs is low after few years of issuing and that the current interval of 10-year validity for EPCs is too long.

NL The Dutch informant pointed out, that an important value of EPCs is revealed once we have long-term data on patterns of energy performance accounting for changes and measures introduced to improve energy efficiency of the building.

„EPCs become more interesting when being used at mutation moments when buildings are in use (by same owner)."

To this we can add, that similarly EPCs have value with regard to comparison between different users and/or type of use.

System related

Future EPCs should become more reliable.
Some of the aspects that hinder reliability of existing EPCs, as pointed out by controlling body rep's, are:

- Fixed use and operational patterns,
- Inexplicit definition of potential energy performance parameters,
- In the context of existing EPC schemes, even non-competent technicians are able to issue certificates.

ES *"The EPC does not have reliability on absolute terms. This is mainly due to the fixed use and operational patterns; for instance, with high thermostatic setpoints for the Mediterranean locations".*

ES *"In the existing EPC schemes, a poor building design very often can be solved with a very efficient technical system; and vice versa. This can be problematic, misleading to performing the wrong energy renovation actions, since the problems of such reality may remain unnoticed. For instance, improving the rated power of the boiler, when the actual problem may be on the demand side".*

NL *"Quality in EP-assessment seems to be decreasing instead of growing. This is worrying. Assuring the right quality will be one the main challenges in future, especially in relation to the new EP performance assessment methods which have much more input parameters than before."*

EPCs should be periodically updated.

ES The Spanish informant stated that EPCs include a lot of information that should be more efficiently exploited than they currently are.

"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".

USER EXPERIENCE AND UTILITY

EPC product

- Content and Utilities –

Existing EPCs do not provide value for small-scale customers – individual households – or individuals who are not interested in selling their property in the near future (upcoming years).

EE The Estonian informant pointed out that general users only perceive EPCs as valuable in the context of sales and rent transactions. Long-term owners and leasers do not have any incentive in improved measured EPCs.

If EPCs are integrated and contextualized with IEQ indicators, energy performance will prove to be a secondary category.

NL The Dutch informant pointed out, that IEQ will and should become first in focus when developing or renovation buildings to very energy-efficient (nZEB) building. What is more, he argued that energy performance will – in relation to IEQ indicators and measures – prove to be of secondary (subordinate) importance.

Needs

PURPOSE & CONTENT

EU-MS divide

EPCs across the EU should be based on comparable standards and features.
The Dutch informant suggested, that EU comparable EPC schemes should contain at least:

- Uniformed lay-out / format.
- Uniformed energy classes.
- Reference data for calculations through central (EU-level) software kernel.

> **NL** The Dutch informant explained that the existing EPC's across EU are based on different methods (NEN7120 method, ISSO method, RVO method). In this light, it is a good step that NL will get one calculation method (NEN; NTA8800) which is required for the new Dutch Energy performance certificates from next January (2021). The new method is mainly based on the CEN Energy performance of buildings standards (especially building related, for installation stull Dutch standards being used).

> **NL** It would be good to develop a long-term vision of an EU software kernel, which could be used in every MS with add-ons corresponding to particular social, cultural and or climate aspects in each country. Related to this central kernel, the CEN Energy performance of buildings standards need to be less complex and more practical to use for the professionals and EP practitioners. It's time to start with new CEN/TC's with practitioners involved (instead of only/mostly scientists and manufacturers)

QUALITY

System related

A register of certified EPC issuers.

> **IT** The Italian informant suggested the need for a register of certified EPC issuers.

USER EXPERIENCE AND UTILITY

Policy guidelines should focus on streamlining the EPCs for individual homeowners.

> **EE** The Estonian informant pointed out that 45% of measured EPCs and 80% of calculated EPCs (data from the first half of year 2020) were issued for single-family dwellings. From viewpoint of policy enforcer, the main workload is thus dealing with smaller buildings, even if it is not in proportion to the absolute energy expenditure in the building stock. They also added, that local governing entities lack guidelines for checking measured EPCs.

EPCs need to be user-friendly and user-centred.
Existing EPCs are largely expert oriented. Complexity of information and expert language included in the EPCs makes them incomprehensive for general users. In addition, information is presented in a way that general users find it hard to see any pragmatic use of the document. That diminishes effectiveness and value of both experts' work and the gross value-chain of EPC certification. Here are suggestions for potential

improvements by independent controlling body rep's:

EPC product

- Design –

- **An introductory section to EPCs**. Several informants pointed out that certain concepts in the EPC (demand, consumption, etc.) should be explained and contextualized for the general user to understand them better.
- **Language and indicators in EPCs should be more comprehensive for general users.** The Spanish informant claimed that the language and the indicators in the existing EPCs should be modified in a way that they are less abstract and easier to understand for general users.

  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."*

  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)."*

  NL *"Energy performance certificates need to be unambiguous, to be aligned along a ruler as reference and they must look very consistent to make mutual comparison possible. So the first page of EP-certificates should look the same. Second or following pages) should go more in detail. For consumers it is a good step that the future energy performance indicator in NL will be expressed in kWh/m2 instead of a dimensionless index number."*

  NL *"There is a need to differ energy class A, because nowadays it is quite easy to get an energy label A after taking energy saving measures. To increase sustainability within the building sector it is a good idea that the Netherlands introduced classes A+, A++ and A+++."*

- Content and Utilities –

A concrete and detailed recommendations section in EPCs.

ES The Spanish informant stated that concrete changes to the format of recommended measures are needed in other to boost energy renovation actions by EPCs.

"Instead of giving results in terms of energy savings or demand reduction, there should be a translation into concrete actions; i.e, changing the windows, installing PV for self-consumption, etc".

EPCs should become more interactive.

ES The Spanish informant stated that EPCs should improve in connectivity with smart meters in order to provide better added value for users.

"An idea would be to connect the EPC with the utility smart meters existing in almost every building. By means of an app this interaction could be managed. This could lead to a dynamic, time-varying EPC, with warnings and notifications about the energy use, etc."

Integrate EPCs with a checklist for IEQ category III compliance assessment.

EE The Estonian informant suggested to include a – Yes/No – type of registry entries for HVAC system presence in buildings, pointing out that this data is already in national registries for buildings entered since 2014. However, the accuracy of this data for older buildings is sometimes inaccurate. He suggested that since EPC issuers needs this data for the calculation procedure, they –

as a competent authority – could also be made responsible for creating/updating the entries in the registry based on their on-site visits.

NL The Dutch informant claimed that the focus of existing EPCs continues to be fixated on energy performance, arguing that it should be focus more on IEQ aspects, particularly ventilation and thermal comfort.

Certification body representatives

Key role: Policy implementer.
Key motive/interest: Transfers policy into practice.
Key insights: Insight into balance between theory and practice.

Representatives of institutions responsible for schooling of EPC issuers and/or development of the EPC methodology and tools for certification. They take care a large part of responsibility for effective implementation of national EPC schemes, maintaining quality of issued EPCs, and have a direct impact on the actual renovation process. They have an insight into the current state of EPC issuing processes and structures. They also have an overview how related knowledge, methodologies, and tools developed through time. They are likely also one of the main references with the capacity to imagine potentials for possible future developments of EPCs.

U-CERT reference ● *Current energy performance assessment and certification practices are not understandable, popular and widely acceptable by majority of the building owners especially in the private sector. This reflects in lower EPC implementation rates.*

Identification of the specific barriers versus the possible drivers to use a next generation of EPC's. Using focus groups for each user group more reliable and 'desirable' performance certificates for the next generation EPC schemes will be created making the assessment process more user friendly and cost-effective.

Informants' background by countries ●

BG Certified energy auditor, employee of a licenced energy auditing company/EPC issuer.

ES Voluntary Certification guideline developer, with professional experience as architect.

HU Head of the Hungarian Chamber of Engineers.

IT Professor, engineer and an experienced EPC issuer.

SI Head of a well-established institute dealing with environmental technologies in buildings.

Expectations

PURPOSE & CONTENT

General statements

Next generation EPCs should have greater presence in the value chain of the building.
Many informants pointed out that EPCs have not reached the full potential. Next generation EPCs should be superior in comparison to the existing EPCs in aspects of user support (for both expert and general user) and certification methodology.

Nothing much will change regarding EPCs in the near future.

SI The informant from Slovenia expressed doubt that any meaningful change can be expected regarding EPCs or certification scheme. His comments, such as that in Slovenia "nothing can be done properly" and that it "all" depends on partial interests and relations between individual stakeholders reflects deeper structural and systematic challenges, that although transcending the scope and focus of our project they have a considerable impact on its results. The informant also believes that EPCs do not have considerable potential to influence people's behaviour or patterns of energy use.

BG The Bulgarian informant stated that although there are (technical) grounds for improvement of EPCs there is not enough economic stimulation to expect significant change to EPCs in the next couple of years.

"There are undoubtedly technical grounds to improve the EPC; but however 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."

ES The EPC, along with the energy efficiency part of the Technical Building Code, came in place in Spain around the time of the 2008 economic crisis. Acceptance of the regulation should therefore be considered with regard to this uncertain context. Before 2006 the building and construction sector was booming and little consideration has been given to energy efficiency while the EPCs have not been existing. After 2008, the combination of strict building regulation including EPCs and an economic crisis took a toll on the construction sector in Spain. The change of paradigm has been too great in too little time.

EU-MS divide

EPCs should stay tailored to the needs of MS, but a transparent framework for comparison on EU level should be developed.
There is a level of disagreement to what degree EPCs should be unified on the level of EU. A framework for meaningful comparison, however, seems to be regarded as a positive development.

HU The Hungarian informant stated that national certification systems should be kept as it is. He claims it is not necessary to unify and make them comparable at the EU level. However, it may be interesting for the professional how the energy performance certificates made in different countries relate to each other, e.g. what is the reference value for the classification.

ES The Spanish informant stated that it could be beneficial to have some kind of

comparability on a European scale. He believes that if the methodology was agreed on the international level, that would result in better quality EPCs, better communication of the final product, and potentially also trigger international investments with a positive impact of, even if it might not affect the majority of the building stock.

Expert-user divide

The EPC scheme's purpose is for experts only.

SI The informant from Slovenia stated that EPCs have practical value for experts and not for users, and that it should stay that way.

"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."

"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."

Next generation of EPCs should be user-friendly, however, remain expert-centred.

While some experts claim the EPCs are – and should remain – an expert-centred document, the majority believes it should also be made user-friendly to meaningfully communicate information to the general users. That includes aspects of connectivity and attractive features appealing to general users.

HU The Hungarian informant claims that future EPCs should give priority to aspects of professional use. He claims the EPC appears as an obligation for the average user when buying or selling real estate or requires for a building permit. 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.

Better integration of the EPC in the design process

ES In order for the EPC to be more useful, there would be a need of returning to the initial idea when EPC was conceived. It should be important to regard it as something giving extra-value to any project. In the industry, this goal is reached, the energy label is everywhere, on every product, it is constantly shown. Whereas in the building sector, the label, if it is present, is not advertised at all, since it also tends to be poor; very often, although it is the law, common practice makes that EPCs are not required when purchasing/selling a building.

QUALITY

Method related

The calculation method should be more precise.

HU The Hungarian informant claimed that the current calculation method is not always suitable for obtaining useful data for end-user or for professional, because in some cases there is a gap between the calculated and the real energy consumption. However current EPC is suitable for comparison. In other words, the average user cannot interpret the EPC, he/she can only compare the ratings to each other.

The currently applied measurements are not suitable for operational rating.

HU The Hungarian informant claimed that measured energy consumption of technical systems and equipment (chillers, boilers, AHU, lighting, etc.) cannot be separated due to lack of sub-meter measurements in the existing buildings. Consumption data determined on the basis of energy bills sometimes cannot be managed on a monthly basis due to annual accounting. Installing appropriate

measurement system is necessary for analyzing the real energy consumption.

Expertise related

Criteria regarding requirements (competences and skills) for EPC issuers should be improved.
Complaints regarding qualification of EPC issuers have been voiced by both experts and users of EPCs, importantly also by the certification body rep's.

USER EXPERIENCE AND UTILITY

EPC product

- Content and Utilities –

Future EPCs should be integrated with programmes for financial support.

BG The Bulgarian informant pointed out that existing EPCs only offer value for very specific "types of clients" and argued that future EPCs need stronger relation to systematic financial support to provide value for wider public. He does not, however, anticipate change, saying that energy consultation services and issuing of EPCs will most likely continue to be related to requirements for application on specific funding lines.

"There are generally two types of clients: those who need to prepared 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"

Needs

QUALITY

Method related

Comparability improvements
Several informants emphasized the need for a reliable EPCs framework for comparison.

> **IT** The Italian informant suggested use of an equal quality scale for climatically different regions.

Reduce the gap between calculated and real energy consumption.

> **HU** The Hungarian informant suggested that a calculation method should be developed in order to reduce the gap between calculated and real energy consumption.

System related

Better collaboration, more trust, and transparency among key stakeholders.
As several other experts, the Bulgarian informant highlighted the need for functional professional collaboration, transparency, and active involvement of a wide range of professional community. For Bulgaria, he specifically stressed the general lack of trust for key high-ranking proffesionals – members of the the Chamber of Energy Auditors – who have significant influence in the policymaking and implementation.

> **BG** *"I used to be a member of the professional association – the Chamber of Energy Auditors in Bulgaria, but I am distanced from it because of the way they work. The should maintain the professional standards but it seems to me they are driven by external interest."*

> **BG** Lack of transparency is a big part of the problem, the Bulgarian informant stated, as decisions regarding the development of EPC scheme are taken in closed circles.
>
> *"As far as I am aware, the decisions to develop the certificated are taken by the Sustainable Energy Development Agency and the team of the Technical University around prof. K'nov."*

Need for clear expression of political will from responsible institutions.
Openness for change and constructive collaboration has proven to be a key element behind positive developments in implementation of EPCs across the EU.

> **BG** As an example, the Bulgarian informant stressed that the failure of key state- and local-level institutions to implement obligatory building passports with integrated EPCs for existing buildings in 2014 continues to demotivate many stakeholders. As our contributors explained, municipalities should control the certification process on the ground and the Ministry of Regional Development and Public Works should control the municipalities, but this does not happen. The new term in 2022 seems to be problematic as well
>
> *"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."*

Need for a register of certified issuers.

IT Several Italian informants suggested that a transparent register of certifiers would be an important positive addition to the EPC field.

USER EXPERIENCE AND UTILITY

EPC product

- Design –

Different levels of EPCs for different users and different user needs.
Several informants stated that EPCs should be designed to provide various levels of complexity of data. Each level should be designed accordingly with consideration of the background knowledge, needs, and expectations of their users.

HU The Hungarian informant proposed two levels of EPCs:

- 1st level for average users, e.g. for buying/selling a property
- 2nd level for professionals containing lots of detailed data

- Content and Utilities –

Emphasize the role of automation systems and smart operation.

HU The Hungarian informant pointed out, that in many cases it is evident how to develop the building structures and HVAC systems, but there is no public awareness of how much energy savings can be achieved with the development of the automation system. Smart readiness of a building should be presented in the EPC. The development of smart systems should also be encouraged.

Issuers of the EPC

Key role: Policy implementer.
Key motive/interest: Delivering a quality product (business opportunity).
Key insights: Insight into hands-on problems of EPC methodology and market challenges.

Representatives of institutions and individual qualified experts that issue EPCs. They offer a valuable insight into practical strengths and weaknesses of existing EPC schemes, including its methodology, tools, and the established system of transferring policy into practice. What is more, they have a good understanding of the general public opinion about EPCs, its impact, and understanding of its practical value.

U-CERT reference ● *Complex and time consuming process of getting the data that might become even worsen thus increasing the costs. How to simplify it and implement new EPBD demands.*

Informants' background by countries ●

BG #1 Experienced EPC issuer, head of a successful energy consultancy company.

#2 Experienced EPC issuer, head of a regional energy agency.

EE Energy efficiency specialist, also involved in research activities in EPC guideline development.

ES An industrial engineer with expertise in EPCs and with experience dealing with them, both in the building and industry sector.

HU Experienced EPC issuers.

IT Professor, engineer, and an experienced EPC issuer.

NL Senior advisor/director of a consultancy company that issues labels, develops EPC software and EPC methodology.

RO Twelve (12) EPC issuers (civil engineers, building services engineers, other type of engineers, architects).

SI Experienced EPC issuer and head of a successful energy consultancy company.

Expectations

PURPOSE & CONTENT

General statements

People's awareness about EPCs is low.

BG The Bulgarian contributors summarized their informant's experience and opinions in the following points:

- Informants describe end users as unaware of their obligations regarding EPCs and the benefits of the energy auditing in principle.
- This is related to the low level of awareness for the benefits of energy efficiency.
- EPC are hard to understand for non-specialists.
- As a result, EPCs are rarely used in practice.

  "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"

EPCs need to be re-established as a vehicle of added value.

As stated by several experts, the original idea behind EPCs is to create value for everyone involved in the certification process. Practice shows, however, that the existing EPCs are generally regarded an "administrative necessity". EPC issuers noted that this renders EPCs an entity with a self-fulfilling purpose.

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 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."*

The focus of future EPCs should be revised and clearly defined.

Several EPC issuers expressed an opinion that the existing EPC schemes have a false focus. Here are some of their viewpoints.

- **The focus should be on energy needs and use.** The Slovenian informant stated that the existing focus of EPCs is on energy savings and that it should be on energy needs and use.

  SI *"We should focus, first and foremost, on aspects of energy needs and use. Everything else is secondary."*
- **The existing EPCs are misleading with regard to their declared focus on energy efficiency.** The Spanish informant stated that the focus of current EPCs is on environmental aspects, since the EPC are not labels according to pure final energy consumption.

  ES *"The primary energy and emission factors are administrative decisions, which translate a certain energy consumption in equivalent based on primary energy or emissions. Thus, the situation of having for instance a biomass boiler, which is a system with low efficiency compared to others, usually yields a great energy label, because it has low primary energy and emission factors. Somehow, a masking of the reality of the building occurs, because the primary energy and emission factor takes the majority of the weight. This sends a contradictory message, because the focus is not on the building energy efficiency, but rather on the energy source used, becoming a environmental certification*

rather than an energy one".

The EPCs will probably change sometime in the distant future.

BG The Bulgarian informants do not expect significantly change in the short-term. They believe the application of the mandatory EPCs is important for the stable increase of the renovation rate. However, they anticipate the process of improvement to be – again! – long and demanding with new unforeseen challenges.

"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)

They go on to say that the existing EPC scheme is sufficiently detailed and that the established practice is sufficient.

"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"

Here are some of the things they highlighted in this respect:

- The Bulgarian EPCs are – on the declarative level – a result of a well-designed process with high quality criteria.
- If changes happen, they would be connected to smart buildings indicators (SRI) and digitization and simplifying the auditing requirements for individual buildings

They also highlighted weaknesses of the existing Bulgarian EPC scheme:

- In many operational programmes the energy audits must reach a certain level of savings to achieve the maximum number of points, which is a basis for compromising the quality.
- The calculation methodology allows "playing" with the expected consumption of the appliances.
- 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.

HU In Hungary, EPC issuers generally believe the quality of EPCs is generally good and expect this will continue in the future. They explained the controlling of EPCs is made by Hungarian Chamber of Engineers, which call on issuer, whose EPC contain elements to be corrected. If the issuer does not cooperate, he/she can lose the authority to make EPCs.

Expert-user divide

EPCs are and should remain an expert-oriented document.

Several experts regard EPCs as a document that does not necessarily require user-friendly features. The Slovenian EPC issuer gave an illustrative remark when we explained, that one of the key goals of U-CERT project is to make the new generation of EPCs more user-friendly and useful, so that users would look at them more often.

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."

EPCs should be more attractive and meaningful for the general users.

Several informants expressed opinion that the energy label – including the graphically presented classification – is the only element of existing EPCs that meaningfully communicates to general users. The vast majority of the EPC, however, is not representative, contextualized, and incomprehensive for most users. That also includes parts of the report, which are specifically dedicated to the user, such as the section recommending measures and interventions to improve energy performance.

ES *"The energy label is deemed to be attractive to the user. However, the report is not so desirable or understandable for them. Most of the contents of that report are not meant for them, but the Energy Saving Measures (ESM) of the report it is and is not meaningful for them".*

NL Dutch contributors summarized their informant's view, saying that the current certificate is based more on the needs of the industry than on the needs of the end users.

"This should change. It is good that overheating is now part of the certificate, but for the housing companies it is not necessary to solve all problems in one instrument. Issues such as indoor air quality are quite complex and are affected by many components that cannot be captured in a simple tool."

HU EPC issuers from Hungary believe that the existing content of the EPC in Hungary is reliable and easy to understand for experts, however their experience is that their clients (end-users) do not understand the EPC without detailed explanation of the issuer.

QUALITY

Method related

EPC schemes are a complex concept with a promising theory and often problematic practice.

ES EPCs are very rigid and were limited from the beginning, a Spanish EPC issuer claims.

"In the residential EPCs is impossible to introduce innovative control strategies (e.g. HVAC centralized control, smart metering…). For non-residential EPCs it is somewhat possible, but always by means of fixed schedules".

"In the non-residential buildings, the current EPC methodology used a comparative assessment of the object building against a reference building. The use of the building is not a parameter that changes between the object and the reference building; the reference building is assumed to be used with the conditions defined for the object. Therefore, the added value of the detailed control strategies to use the building is not seen in the final EPC".

System related

With appropriate legislation and regulation in place, EPCs could become an efficient tool for systematic improvement of Energy performance of buildings on the institutional level.

SI The Slovenian informant claimed there is no discussion about big buildings and facilities with poor energy management. Similarly, there is little discussion regarding necessary competences for efficient result-oriented energy management.

Changes are generally difficult to introduce because of inertia of existing structures within the established

EPC schemes.

SI The Slovenian issuer believes the existing structures and networks of individuals involved in the implementation and realisation of the EPC scheme is a problem in itself. Established relationships and personal interests are likely going to be reluctant to change.

"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 is prepared to make an effort to improve it."

The existing state support (subsidies and programmes) for improvement of energy performance of buildings should be revised and synchronised with the new EPBD directive.

SI The Slovenian informant claims the existing support for improvement of Energy performance of buildings in Slovenia, institutionalized in The Eco Fund, is not holistic and non-expert.

"The Eco Fund has been promoting insulation of buildings for years. But I am shouting my lungs out that they are supporting non-expert measures. /…/ Concretely, talking about the [indoor] air quality – Slovenia is, with Portugal and Malta, at the very top consider bad air quality. More than 25 % of space have bad indoor air quality. Czech republic is the best with 5 %, the EU average is 12 %. /…/ And this is the result of the Eco Fund, sealing the buildings for the past 15 years."

USER EXPERIENCE AND UTILITY

EPC service

- Content and Utilities –

Measured energy consumption.

There are different points of views concerning the integration of measured energy consumption into the EPC.

HU **Several Hungarian 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.

HU **Some other Hungarian 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 regulation, but there is no established practice, and issuers generally do not support it. The calculated value is comparable. The inclusion of the 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).

PUBLICITY

More and better communication campaigns.
People need to understand the purpose and benefits of EPCs and related policies. To achieve wide base support, the building renovation in general and EPCs in particular have to be systematically and efficiently communicated.

> **BG** *"People do not understand the EPCs in general 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."*

Market for EPCs should be created by the providers and issuers themselves.

> **BG** A Bulgarian informant stated that the state should function as a regulatory body, but consultancy companies themselves should create the market for EPCs. Their communication and promotion campaigns should be based on the messages for the benefits of energy efficiency in general and the additional market services related to the EPCs.

MISC

Cultural attitudes and practices will continue to be a challenge regarding policy interventions and regulations.

> **SI** In Slovenia, the self-build culture and tendency to DIY maintenance and construction is a source of negative attitudes towards EPCs from the general public. Slovenians tend to regard the existing EPC scheme as a restrictive policy affecting the entrenched self-building practices.
>
> *"To illustrate… Slovenia is one of few countries that tolerates self-building. I am positive, that no one fixes his own teeth, sews his own shoes, brews his own beer... And it's easier to brew your own beer than to build a house."*

Needs

PURPOSE & CONTENT

General statements

Increase the market impact of EPCs.
Several informants clearly voiced the need to increase demand for EPCs.

BG The Bulgarian contributors noted the following possible approaches:

- Through means of education.
- By state intervention (law enforcement, support policies, incentives and penalties).
- By targeted market campaigns.

In discussion on the given context, Bulgarian informant commented on how EPCs could offer added value to consumers. *"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."*

Expert-user divide

Increase the value of EPCs for experts.
Following are some ideas by EPC issuers, reflecting on their needs and ideas on how to increase the value of EPCs and the certification schemes:

- **Create new business opportunities**. For many building experts, who took the course for EPC issuers, the scheme proved to be a good business opportunity. They are likely to support future change if it will stay a source of business opportunities.
- **Offer space for support and exchange of experience regarding EPC issuers.** The EPC scheme created space for discussion about Energy performance of buildings and related topics both in the expert communities as well as in the general public. This should be capitalised further.
- **Provide denominators for effective cost-effectiveness calculations.** Denominators for calculating cost-effectiveness of Energy performance of buildings measures and investments needs to be unified and clearly defined for issuers to be able to provide their customers to provide reliable case-specific measures.

SI *"On the fourth page* [of the EPCs] *there are suggestions for energy efficient measures, yet no instructions are given to how cost-effectiveness of these measures should be calculated."*

QUALITY

Method related

Better support and improvement of EPC methodology.

SI *"We have a program support that is not meant for certification, but making projects, and I say illustratively – a cook book enables you to cook great dishes, but when you evaluate the dish on the basis of a cookbook, you have an issue."*

Future EPCs need to be integrated with better metering systems, especially in residential and single-family

dwellings.

EE Estonian informant pointed out that metered energy is often "lumped" together into single master meter, making measured EPC calculation inaccurate as the finer resolution of data regarding individual system parts is missing. Separation of seasonal (room heating) and non-seasonal (DWH heating, appliances, lights etc) energy consumption for weather-based normalization becomes a complicated task with different experts making different assumptions.

"In a study conducted 4 years ago, 40 EPCs were checked and recalculated according to the guidelines, and only 2-3 EPCs had the same ETA-value (kWh/m2y)."

Need for a stable and reliable framework.

ES One of the main causes for the lack of reliability, as commented by a Spanish EPC issuer, are constant changes in the regulatory framework.

"Another problem with the credibility is the changing of the primary energy and emission factors throughout time. If the factors are changed, then the same building will have different EPCs depending on the year of issue. This created uncertainty in the sector."

EPCs need to account for buildings' purpose and mode of use.

EPCs often provide a misleading assessment of building energy performance, both in residential and non-residential buildings, disregarding the building's actual purpose and/or mode of use.

ES *"Lighting and appliances could be included in the residential EPCs, as well as other equipment in the non-residential sector. Not considering other equipment in hospitals and hotels makes it difficult to provide a meaningful EPC."*

EE The Estonian informant pointed out that situation is better in new non-residential buildings as property owners themselves are more and more interested in detailed energy monitoring as a means of expense monitoring and optimization, and thus are willing to invest into additional energy meters that integrate with the BMS.

NL *"We want people to take action, but does the label induce action? Maybe we need a broader label, including user behaviour."*

Optimize the existing certification procedures and methodology.

SI EPC issuers from Slovenia commented, that their calculation application for issuing EPCs has a number of shortcomings, some also related to questions of cost-efficiency and quality. Some highlighted aspects include:

- an inefficient interface,
- involving repetitive tasks and generally being very time consuming,
- the system requires experts to spend time on tasks that do not require expert qualifications.

Integrate EPCs with related, already existing, and well-established processes.

BG The Bulgarian informant suggested to continue the process of issuing building passports and integrate them with EPCs.

HU Hungarian informants pointed out, that 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 energy performance certification process, because in several cases the user is not able to influence the "smartness" of the property,

for example an apartment owner in a block of flats, where are central systems in the building.

System related

Introduce or reform administrative procedures and legislation in favour of quality and efficient renovation.

Many experts voiced concerns regarding the existing administrative procedures and legislation concerning energy performance of buildings, claiming it makes it overly complicated and often having a negative impact on developments.

> **SI** EPC issuers from Slovenia commented that rigid rules and regulations, such as the one about public procurement, often prolong processes and even lead to unnecessary costs and complications.
>
> *"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."*

For businesses and institutions, introduce efficient legislation and regulation regarding energy management.

The quality of service can only develop to its full potential given that the recipient of the service is competent enough to use it meaningfully and benefit from it.

> **SI** A Slovenian informant argued that we need a law regarding minimal standards for energy management in public buildings and/or big facilities. He claimed that this would bring about efficient change, because such pursuits are simply a matter of delegating responsibility.
>
> *"But 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."*

For individual homeowners and simple households, introduce legislation that *encourages* rather than discourages (or punishes) investments into energy performance of buildings.

> **SI** A Slovenian EPC issuer stated that currently investments into Energy performance of buildings can hardly be viewed as cost-effective. In the light of the forthcoming "housing tax", which takes value of buildings as a reference point to determine due taxes, people who invest in improving Energy performance of their buildings – and indirectly raise the value of their property – are likely to be taxed more than those who do not.

Responsible institutions should demonstrate their political will and enforce legal sanctions.

> **BG** Lack of active support for implementation of EPCs has proven to be a recurring issue in several EU member states.
>
> *"Even at the moment, there are* [theoretical] *sanctions when the audit is missing. However, no one is imposing them."*

Improve quality control and increase capacity of the controlling authorities.

Quality control and supervision is equally as important as providing quality service at the beginning.

> **BG** The Bulgarian informant stresses this especially for cases of "mass auditing", when a series of audits and/or EPCs are issued in the context of a single contract or project, such as in the case of public support programmes or orders of large institutions involving larger numbers of buildings.
>
> *"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."
"At this moment of time, SEDA does not have the expert capacity to perform its controlling function. However, if penalties are implied and fees are collected, the resource to maintain this capacity would be easily collected."

Increase the price of EPC products and services.
Several experts emphasized, that low price has a negative impact on the quality of EPCs. Most obviously so is in the case of (public) procurement procedures, where the lowest price is often the leading factor. This too often results in low quality EPCs. At the same time, the certification cost is too low for some of the responsible experts, given the administrative requirements to complete the full set of documentation, which takes a lot of time

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."*

HU Also the Hungarian EPC issuers believe the cost of EPC in Hungary is too low. There is a cost limit in the Hungarian regulation, which is 5500 HUF per hour (~16 EUR per hour), which results in very low costs of EPCs in the market. The issuers believe the price should be higher in the future, especially in the expected case when more detailed measures have to be elaborated and other analysis should be made, the current low price included in the Hungarian regulation should be increased.

Expertise related

Higher standards regarding qualifications of EPC issuers.
Several EPC issuers themselves pointed out that quality issuers are key for ensuring high quality of EPCs. While the existing regulations and means of control tend to cover theoretical competences reasonably well, practice often plays out in contradiction to the established indicators.

BG The Bulgarian informant highlighted the need for courses and more highlgy qualified providers: *"At the moment, the certification is not in 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."*

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* [by the work of EPC issuers] *and the quality of the implementation is not sufficiently good."*

EE The Estonian informant pointed out that in the existing system, it makes no difference whose signature is on the EPC once it is issued, even if the quality is low. Regulating bodies do not have the time resource or level of competence to screen all issued EPCs (the screening process might take longer than the time taken to calculate and issue the EPC for single-family dwellings). Furthermore, revoking an EPCs issuer's licence is very rare, even if it's known that there are problems with a specific EPC issuers.

Following are corresponding needs emerging from feedback by EPC issuers:
- concise and efficient standards for education and work of EPC issuers,
- control of issuers' work,

- closing the void between theory and practice (regarding purpose of EPCs, calculation methodology),

Incentives and support for meaningful and efficient interaction between end users and issuers.
Experts agree that education of both general users and experts should be a part of the future EPC schemes. Their opinions on how it should be integrated in the scheme, however, vary substantially.

- **More interaction creates value.** Some informants claim there is a potential to improve quality of service provided by issuers related to their (educational) interaction with their clients. Some inputs by both experts and users, however, suggest that this is only true in cases where the clients are factually interested in such content.
- **Give more responsibility to the issuers.** Some informants suggested that as the EPC issuer presents results of the performance assessment, they should also educate the end-user about aspects of the particular building/housing unit's energy performance properties and potential improvement measures.

  NL The Dutch informant argued that advisors should get a more important role. *"Let the advisor give advice. An advisor knows what to do best in each situation for a given household."* He claims that in the existing Dutch EPC scheme, this is taken out of the assessment process to keep costs low and to limit responsibility of the issuers.
- **Avoid dysfunctional regulation and requirements.** Some believe it would not be wise to institutionalize a requirement for EPC issuers to educate their clients. This could result in work overload for issuers and potential negative attitudes towards such developments on the issuers' side.
- **Incentivize meaningful interaction.** In contrast to top down requirements, strategies to incentivise issuers' interaction with clients are needed, such as providing them with specialized educational content, access to professional support etc.

  NL Dutch contributors summarized their informant's opinion, saying that advice automatically generated by the existing EPC tool is not worth much. Instead, more emphasis should be put on the expertise of the advisor.

USER EXPERIENCE AND UTILITY

EPC product

- Content and Utilities –

Include history of all the interventions made to the building.
Several informants suggested that including information on past interventions to the building, such as what, who, when, and how performed/implemented the measures, would potentially be a valuable addition to the future EPCs. Such information enables contextualization of current energy performance. Furthermore, without such referential information it is hard to define effects of interventions on the long run and to account them as being good or bad practices.

Continuous monitoring.
Several informants claim continuous monitoring of energy performance would be a useful addition to the existing EPC scheme.

SI *"It* [the data] *is useful, when it is 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?"*

EE The Estonian informant pointed out that without the finer level of detail in the measured

EPCs, the end-user does not get any feedback as to why their measured EPC value is higher than on the calculated EPC (i.e. which system is expending a lot more energy than anticipated), only that total energy consumption is higher. Such feedback is vital for improving energy efficiency.

More and particularly different indicators are needed.
In relation to comprehensiveness and user-friendliness, EPCs need to include indicators that allow users and experts to interact meaningfully both with each other and with the document itself.

ES *"The ESM document is incomplete, not-so-reliable nor easy to understand. It will be very convenient if it were more understandable. One of the reasons may be due to the unit used, € should be used instead of kWh, for instance. Also touching aspects of energy poverty, valuing discomfort or covering basic needs in a building".*

ES *"Especially since most retrofitting actions in the residential sector start due to health, safety and wellbeing, not energy efficiency. There a need of touching those elements in the EPC".*

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."*

NL Dutch contributors summarize their informant's opinion, saying that the actual measured energy on the certificate on itself does not help the advice. It helps the recognizability of the certificate for a user.

HU The Hungarian informants argued for inclusion of heat loss (kW) of the building/apartment in the EPC. Every necessary data is collected for calculating the heat loss of the building, therefore it should be included in the EPC. Presenting the heat loss would be useful for end-users, because they would see the heat loss in the existing condition of the building and also with the proposed measures.

EPC service

EPCs need to be re-established as a vehicle of added value and not as a mere administrative necessity.
As stated by several experts, the original idea behind EPCs is to create value for everyone involved in the certification process. Practice shows, however, that the existing EPCs are generally regarded an "administrative necessity". EPC issuers noted that this renders EPCs an entity with a self-fulfilling purpose.

The financial cost of EPCs and value they provide to all stakeholders needs to be balanced.
Balance of benefits and responsibilities regarding EPCs should be in favour of all stakeholders involved in the certification process.

SI The Slovenian EPC issuer believes that the existing EPC scheme, while it is paid by the owners of property, in practice only serves the state as a statistical tool for the government to report to EU on achieving sustainability goals.

"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."

EE The Estonian informant pointed out that Calculated EPCs generally require modelling of

the building – which in itself is a complicated task to be done accurately. The cost of issuing EPCs is dependent on market perception of its value, currently the added value is not significant enough for the market to self-regulate the quality and price level of EPCs.

- Design –

Provide simplified certification procedures for individual households.
As a step towards securing widespread support and streamlining the EPC products and services, the suggestion to provide simplified services for individual homeowners (simple households) in contrast to businesses and large institutions was voiced by a number of informants.

BG Bulgarian informant suggested to simplify the certification process for individual users, saying that EPCs for individual buildings are too expensive. To decrease the costs, the procedure should be simplified.

"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."

- Content and Utilities –

Minimize the cost-benefit gap.
Several informants highlighted a void between costs and benefits of EPCs. This is most commonly observed in the following cases:

- **New builds and energy efficient buildings** where investments into improvements of energy efficiency are not financially reasonable. In these cases, existing EPCs are simply an administrative necessity and present only cost for the owners of the property.
- **Buildings protected or preserved as cultural heritage.** In these cases, due to highly limited number of possible and/or adequate interventions and resulting high costs, the margins for economically viable energy performance interventions is very narrow.
- **Households lacking sufficient funds.** Some users simply do not have financial capacity to invest into improvements of building's energy performance.

Provide reliable guarantees for users that investments into energy efficiency pay off.

SI *"They* [the EPCs] *need to actually promise and ensure that investments into decreased energy use are reasonable. That they pay back in a decade, that you have tax breaks or something of sorts."*

Enable appropriate financing instruments.
Several experts called for more financial instruments to be integrated with the EPCs. Access to different sources of public and private financing should be made available.

Provide viable and attractive alternatives for households experiencing or facing the risk of energy poverty.

SI *"Install all households experiencing energy poverty with free PV panels."*

PUBLICITY

More and better communication campaigns.
People need to understand the purpose and benefits of EPCs and related policies. To achieve wide base support, the building renovation in general and EPCs in particular have to be systematically and efficiently communicated.

> **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."*

> **HU** Hungarian informants believe a national social campaign would help general users 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, however 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.

MISC

Need for a change and consideration of established cultural practices.
Socio-cultural practices, such as "self-build culture" in Slovenia or the "low renting culture" in Spain affect the construction and renovation sector of economy. Concrete actions should be taken to acknowledge such factors and to meaningfully address them through progressive policies.

> **SI** Stressing the self-build culture in Slovenia as a cultural issue that has a considerable impact on the policy development and implementation, the Slovenian informant stated concrete steps have to be made on the systemic level to efficiently address and mediate potential conflicts. He believes that with enforcement of the forthcoming EPC scheme, negative attitudes towards it are likely to arise as a response to its unavoidably and necessary restrictive nature regarding self-build practices.

EPC Users

Building owners and managers

Key role: Clients, users and beneficiaries.
Key motive/interest: Maximization of building value.
Key insights: Insight into EPCs' financial/cost effectiveness.

Individuals and representatives of institutions who own and/or manage buildings. As owners, their interests are primarily pragmatic. Time and finance investment tends to be their first consideration. Their views, therefore, are key to understand strong and week points of EPCs cost effectiveness. This goes both for short and long-term aspects, as well as for aspects of indirect costs (e.g. price of EPC issuing) and implicit costs and benefits (e.g. expense and savings resulting from measures proposed by EPC issuers).

U-CERT reference ● *Lack information about actual building performance and use patterns and what renovation and or management measures would be best to implement in their particular case and in what order.*

Evidence-based decision-making.

Informants' background by countries ●

BG A representative of the building owner, responsible for property management.

ES A user/ citizen that owns his own property, invest in the real state market and is interested in how Energy Efficiency can be improved through time on his properties.

FR #1 Recruitment and corporate relations officer for an engineering school.

#2 Focus group participants.

HU Focus group participants (lawyer, chef, accountant, teacher) and other lay people.

IT A simple user.

NL Independent advisor to a housing corporation.

SI A representative of an investments office at a large public institution.

Expectations

PURPOSE & CONTENT

General statements

Home owners expressed little expectations about the forthcoming EPC scheme.

> **SI** *"This documents addresses all the points mentioned in the definitions, the problem is reading it. It is not clear. For lay people it is not comprehensive."*
>
> **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."*
>
> **HU** *"The energy performance certification mostly contains information that can only be interpreted by professionals."*
>
> **HU** *"The present form of the EPC is useless."*

Given the established system of EPCs, some informants expect no change whatsoever.

> **BG** The Bulgarian informant on the prospect of compulsory measures and enforced penalties. *"Forbidding buying and selling properties without EPCs? No, this is not possible. It's too harsh. It is not going to happen."*

QUALITY

System related

Public support will continue being central to acceptance and demand for EPCs.

> **BG** With regard to improving widespread public acceptance and demand for EPC services, the Bulgarian informant stated that this will be driven by public support and/or a requirement to receive support for renovation action. As our contributors explained, central government's support typically comes in a form of direct subsidies for private multifamily buildings. It also comes in a form of Operational Programmes for public buildings. The idea is that the demand for EPCs would rise if they would be required for application under the National Energy Efficiency Programme (or similar policy) giving 100% grant for renovation of private multifamily buildings.

Future EPCs should clearly define rights and obligations of involved stakeholders.

> **NL** The Dutch informant pointed out it is important that the limits of the responsibility of the housing owners is considered in the future EP method. That relates to the consideration that systematic pursuit to improve energy performance of building stock should and cannot simply be delegated to individuals and individual businesses, but should be seen as a collective pursuit including state and EU level institutions. In other words, if individual owners are somewhat obliged to pursue efficient energy performance of their property, they should have the right to a variety of high-level systematic support in form of consultancies, financial tools and subsidies etc.

USER EXPERIENCE AND UTILITY

People expect future EPCs to be more user-friendly and valuable.
If any change is about to be introduced to the existing EPC scheme, several end-users and experts expect future EPC to have much more value and can be used for planning renovations. Such developments include:

EPC product

- Design –

- Improvements in areas of user-friendliness.
    - Delivered energy consumption of the building expressed by energy sources in the following measurement units: m^3 gas, kWh electricity, GJ district heating, litre heating oil, kg pellet/wood.
    - Explanation of terms and definitions for lay people (people without relevant knowledge background).
- Improvements in content
    - What it offers already: energy use per m^2 surface and measures proposed for retrofitting and decreasing energy use.
    - Improvements in area of cost-effectiveness and added benefits.
    - Summary of the 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 renovation.
    - Presenting current energy costs and possible energy cost savings expected to follow from the proposed measures.
    - Presenting the heating and cooling loads [kW] of the building in a manner easy to understand.
    - Introducing quantitative data of building structures in a way that is suitable for getting a bid from prospective contractors, e.g. thermal insulation of walls, windows changing
    - Estimated ROI of proposed measures.
- Improvements in service
    - Improvements in area of quality and control.

Needs

PURPOSE & CONTENT

Expert-user divide

Demonstrate value.
Future EPCs need to present users with value in meaningful and comprehensive ways. Presenting value goes beyond energy performance characteristics of buildings. Some of the other aspects include:

- Presenting aspects of IEQ,
- Demonstrating relations between EPCs and other key housing qualities, and
- Putting special focus on communicating the value of EPCs.

There is also a clear need for business models that would justify the cost of issuing EPCs to the users' investments into EPB.

QUALITY

System related

Provide reliable quality control.
The vast majority of people do not have sufficient expertise or experience to be able to assess the quality of the issued EPCs. In this regard, several informants stated that the quality of EPCs should be ensured by control mechanisms imposed by the state.

> **BG** *"It all depends on the state and on the control it exercise. The measures are prescribe, but if there is no control, we tend to do it 'in the Bulgarian way' and only care for the documentation."*

> **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."*

Expertise related

Highly competent experts.
General users emphasized the value of dedicated and well trained building experts, such as building and/or energy managers, and EPC issuers.

> **SI** *"We have this building manager. Lots of times he's not really in the mood, but then he gives you quite useful advice when he does come around. But generally he gives you this feeling, that he doesn't like to be bothered."*

USER EXPERIENCE AND UTILITY

EPC product

- Design –

- **Visual elements.** Research shows visual elements – graphs, photos, colour-scales – are likely the strongest tool for communicating information to general users in the existing EPCs. Users described visual elements as a good reference of scale to the users. They are easy to relate to while exact data is abstract and hard to understand. Experts' opinions support such conclusions.
- **Meaningful reference points.** EPCs should be easily accessible and comprehensive source of information. References to legally required minimal standards (benchmark values), comparative data general users can relate to etc. are very well received when appropriately explained and contextualized. The existing EPCs do include several such references, however, they are poorly explained and insufficiently referenced.

  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."*

  HU The Hungarian informants pointed out that current EPCs do not present information clear enough for general users to understand how the energy class is achieved. The percentage limits of different energy classes (e.g category C is from 101% to 130%) should be shown in the pictogram, which shows the energy classes and the achieved class.
- **Include a key of terms and definitions.** Several informants stated that a glossary of terms and definitions is needed as there are lot of things that are difficult to understand for lay people in the existing EPCs. Many informants also asked to include one page summary for non-professionals, describing the actual condition, the results, and the proposed measures in an "ordinary language".

  HU Hungarian contributors noted that none of the participants of their focus group knew the definition of primary energy. The kWh/m^2a unit was also difficult to understand without explanation. They would like to see the energy consumption in measurement units they buy it (e.g. m^3 natural gas, kg wood, kWh electricity, ...).

- Content and Utilities –

Connect EPCs with people's everyday-life concerns.
When talking about qualities of buildings, that may include aspects of location, size, affordability, security. When talking about people's lives, that may include aspects of health, safety, convenience, finances and time economy.

EPCs should be tailored to the needs of each individual case.
Each building and dwelling, as well as each household, is unique. Solutions offered by EPCs should be as specific as possible.

Provide financial indicators.
Several informants argued that energy *costs* is a reference everybody understands.

HU Hungarian contributors noted, that all participants of their focus group agreed that annual energy costs of energy sources (natural gas, electricity, district heating, wood, pellet, ...) would be very useful to be included in the EPC, because everybody understands it. Furthermore, the potential energy saving of the proposed measures should be also expressed in costs.

Minimize the cost-benefit gap.
Alternative strategies to create value for owners are needed for cases where the existing EPCs present

nothing more than costs.

> **BG** *"When the investor is building to immediately rent and sell, it is all about completing the documentation. If there are long-term goals to use the buildings, then there are requirements for quality."*

Prospect of financial return on investment into the EPC.
Several informants stressed the need for future EPCs to provide users with viable financial value prospects related to investments into energy efficient measures and building renovation.

> **BG** The Bulgarian informant pointed out, that owners and real estate brokers do not regard efficiency as a leading market force that would justify investment into EPCs.
> *"Each certificate gives some advantage, if it is good quality."*

Some potential financial drivers for people to invest in EPB-related services are:

- Making a "good deal" (receiving more benefits than the service cost would suggest),
- Securing some form of tax relief or access to funding,
- Improve or maintain market value of their property, or
- The potential financial savings through low running costs.

EPC service

- Design –

Contextualize measures.
Both users and experts voiced the need for contextualization of measures proposed by EPCs.

> **SI** Slovenian informant pointed out the need to consider measures such as such as static/seismic consolidation of buildings in relation to the measures proposed by the EPCs as a way to avoid unnecessary complications on the long run (structural reliability of the building before its energy performance).

- Content and Utilities –

Enable communication and feedback.
Several informants stated that users should have a straightforward option to connect and interact meaningfully with relevant institutions and individuals (EPC issuers) working in the field of EPB.

Educational contents.
Representatives of owners and managers generally claim to welcome educational content related to EPCs, building energy performance, and related topics. To which extent and in which form, however, needs to be researched in further detail.

> **SI** *"I'd rather have them* [EPC information and suggestions for improvement] *on the phone not to bother with* them [the experts/building managers or care takers]. *And that no one looks into my apartment. It's not their business how I set the temperature. It's my apartment. But if I'd have questions then yes, for sure."*

Some suggestions regarding this topic include:

- An introductory course for new owners of housing.
- Through building management or maintenance staff.

- An office/service available for inquiries.
- A web page/application.

Building occupants / users

Key role: Users and beneficiaries.
Key motive/interest: Aspects of convenience, practicality and comfort related with living in/using a building.
Key insights: Insights into how EPCs (fail to) support/address the key aspects of everyday life.

Informants who reflect on aspects of everyday practice of building use. These can be anyone who live in and/or use building. Also, these can be representatives of institutions who focus on aspects of building use. Their key interest is having (or providing) a liveable/workable environment, which includes aspects of health, convenience, comfort, cleanliness, aesthetics etc. Their key insight is how EPCs address (or fail to address) these key aspects of everyday life.

U-CERT reference ● *Lack information about actual building performance and use patterns and how to best change behaviour for optimizing IEQ and minimizing energy use need for support in decision making, nudging them to deep renovation (in case of home owners) or improving the IEQ and consequently health, productivity. Evidence-based operation.*

Informants' background by countries ●

BG #1 Building occupant – rented dwelling (interview).

#2 Building occupants – own and rented dwellings (focus group participants).

ES A user/ citizen that owns his own property, invest in the real state market and is interested in how Energy Efficiency can be improved through time on his properties.

FR #1 Recruitment and corporate relations officer for an engineering school.

#2 Focus group participants.

HU Focus group participants.

IT A simple user.

NL Facility manager in a nursery and recovery homes.

SI #1 A representative of an office for economic and technical affairs at one of the faculties of Ljubljana University.

#2 Focus group participants.

Expectations

PURPOSE & CONTENT

General statements

General users often have little interest and knowledge in topics related to EPCs.
Most general users without expert-knowledge background knew little about EPCs. Such lack of awareness makes it virtually impossible for people to express their attitudes related with EPCs.

> **BG** Bulgarian contributors came to this conclusion following the realization that users expect to be guided on how to read and use the certificate. They observed that general users are not aware and surprised to learn that there is a document of such nature and offering so many benefits.

> **BG** Bulgarian contributors observed little resistance from general users when mentioning potential obligations regarding issuing EPCs for all buildings.
>
> A Bulgarian informant on the question related to EPC related penalties regarding failure of compliance with the law: *"I don't know really… probably, as it is required, there are some sanctions… maybe there are administrative penalties, or something of this kind…"*
>
> Bulgarian contributors conclude that EPCs will become interesting for many people if there is enough information and awareness of the benefits.

Expert users' viewpoints carry implications for all users.
Users with expert background tend to have more concise opinions about what EPCs could or should be. These can be generalized to all users to a certain degree.

> **ES** *"I expect from them* [the EPC scheme and the EPC issuers] *to create a reliable document that, apart from solving an administrative procedure, can guide me through the energy renovation of my property. If the parameters described in it are correct or not, I have no idea, but they should. If not, a quality control protocol may apply both on the expert and documentation side."*

USER EXPERIENCE AND UTILITY

EPC product

- Design –

Users expect better design of EPCs.
When reading the existing EPCs general users have difficulties to make sense of data and information provided in the document. Visual elements – such as graphs, pictures and colourful scales – tend to be the most effective and appealing elements of existing EPCs, the vast majority of other data and information tends to be poorly understood.

> **ES** *"Basically, I don´t know where to focus my attention when reading it a part form the energy scale. The document is flat regarding the information presentation and its layout. A graphic review would be necessary."*

> **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?"

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."*

- Content and Utilities –

EPC service

EPCs are generally regarded as "administrative necessity".

Both expert and general users tend to regard existing EPCs as administrative necessity. Many expressed doubts with regard to utility or purpose of EPCs, particularly in the aspect of their impact on the overall energy performance on their home. Existing EPCs seem to have little relevance either to real estate brokers or buyers when selling and more importantly when buying property.

ES *"Usually, when I am interested in buying a property the EPC related to it is on hold or being developed, which means the real state agency doesn´t care too much about energy efficiency to promote investment transactions in buildings. I wish they were available as energy efficiency is one of the parameters that are in my equation when buying."*

SI A comment by a real estate broker: *"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 payed 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."*

Needs

QUALITY

System related

EPCs need a stable and reliable conceptual framework.
Several critics have been noted in relation to regulation and use of existing EPC schemes.

> **ES** A Spanish informant interested in real estate investments commented, that regulation and use of EPCs should be revised and implemented properly.

USER EXPERIENCE AND UTILITY

EPCs need to be user-friendly and user-centred.
Existing EPCs are largely expert oriented. Complexity of information and expert language included in the EPCs makes them incomprehensive for general users. In addition, information is presented in a way that general users find it hard to see any pragmatic use of the document. That diminishes effectiveness and value of both experts' work and the gross value-chain of EPC certification. Here are suggestions for potential improvements by building users:

EPC product

- Design –

- **Use vocabulary commonly used by general population or provide sufficient explanation and contextualization.**
- **Provide meaningful reference points.** Bulgarian informants stated that energy parameters (kWh/m2) are hard to understand, but meaningful comparisons with average or minimally required values would be more comprehensible.
- **Clearly display correlations between individual pieces of data and information.** They expect EPCs to provide a transparent correlation between the categorisation and individual billing point (heating, cooling, etc.). Ideally, EPCs would also include references to monetization aspects, translating quantitative indicators into financial indicators.

- Content and Utilities –

Provide explicit directions.
General users generally expect the EPCs to contain explicit information directing them to improve their building's energy consumption. They also expect information on how to adequately maintain their property and how to perform their refurbishment.

> **BG** Bulgarian contributors pointed out that users of existing EPCs generally expect to understand more about the building and the performance characteristics in connection to the suggested renovation measures.

Provide well defined and comprehensive information.
People expect EPCs to provide comprehensive and unambiguous information. They want to understand why a building is categorized in a particular energy class and how its performance could be improved.

Provide a variety of possible measures.
Users expect EPCs to highlight simple (no-investment) actions for improvement of building's energy performance and consumption.

Provide detailed case-specific recommendation.
Users expect EPC to provide realistic, detailed, and case-specific information (and directions), not ones that are generalized or simplistic.

> **FR** Participants of the French focus group agreed that they would prefer to have no recommendations at all than have bad advice or "copy-paste" advice.

Provide a variety of comprehensive and practical information, not only technical specifications.
Bulgarian informants, as several others, suggested that EPC schemes and related services could integrate information about other services regarding the renovation process and not only technical information. They believe EPC should not be an end but a means to stimulate the renovation.

> **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."*

Some other suggestions by building occupants and users include:

- **Access to general technical specifications of the building.** The access to information about the building is something that is generally lacking. Several informants suggested this gap could be covered by the future EPCs. The information should be meaningfully ordered and accessible on demand.
- **Include health, and IEQ indicators.**
- **Integrate EPCs with domotics (home automation).**
  > **ES** A Spanish user suggested EPCs to include aspects of health and domotics (home automation) in relation to energy efficiency and building energy performance. Transparent presentation of such relations would raise awareness, impact people's practices, and create value for general users.
- **The use of EPCs for building maintenance and other aspects of household economy**. There is a need to better associate the conditions of the building components and systems to the required action from the owners.
  > **NL** Dutch contributors summarized their informant's viewpoint, saying 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. If you design the house well, you can make the house healthy and save energy. But you save the most energy when you do not ventilate the house: so, you should start with the parameters that make the house healthy.
  >
  > **FR** French contributors noted that people regard EPCs as documents that should provide information on how to improve a building in an energy efficient manner and to do so explicitly, highlighting how much money they could potentially save and which measures they should introduce to achieve those savings.
- **Include financial indicators.**
  > **ES** *"It is essential to include economic indicators relate to the investment costs of the renovation measures to be implemented as well as knowing the impact of those measures on the property energy performance."*

- **Comparison with other buildings/dwellings in the same class.** The 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.

EPC service

- Design –

Better user interaction.
Given the general disinterest and lack of knowledge about EPCs on the side of the users, it is essential for future EPCs to engage users in some sort of meaningful interaction. Low level of awareness is not only a reflection of the current condition of EPC schemes but also has a continuous negative impact on the general public's attitudes towards EPCs.

Make investment into EPCs reasonable, or better yet, attractive.
Here are some suggestions given by building occupants and users:

- Enable easy access to state financial support for renovation projects.
  > **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."*
- Highlight the prospect of potential financial savings.
- Highlight the prospect of higher 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."*
- Highlight the prospect of better IEQ.

- Content and Utilities –

Education and information
Lack of information about the building performance was noted as "surprising" for the end-users themselves. Promoting the educational elements of the EPC scheme is generally regarded as driver for higher quality.

> **BG** *"If it is a real certificate, it should give important information – if you could live well, to be warm at wintertime, to feel cool in summer."*

PUBLICITY

More positive publicity for EPCs.
Research shows that advertisement and public image of EPCs is very important and should be pursued systematically. This claim was voiced both by experts and general users in several EU member states.

> **ES** A Spanish informant stated that if EPCs are important for the building market, communication and market campaigns need to be improved.

> **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."*

Housing companies

Key role: Clients and beneficiaries.
Key motive/interest: Providing quality service to their clients (good business results).
Key insights: EPCs related aspects regarding optimization of costs and benefits.

Representatives of institutions whose core business is building management. They are primarily focused on financial success and long-term value of their services. They have a good and particular insight into impact of EPCs, its practical value and cost effectiveness aspects. They tend to search for the best cost-benefit compromise to offer good service to their clients, maximize savings and minimize costs (long and short term).

U-CERT reference ● *Have the need for holistic certification schemes which also addresses issues like IEQ, thermal comfort, health to communicate with their tenants as well as for the support on decision making on deep renovation going beyond classical savings – investment to more holistic CBA.*

Informants' background by countries ●

ES Representative of a Public owned housing entity in the Valencian Region.

HU Representative of a successful housing corporation in Hungary.

IT Housing companies employee.

SI Head of a successful housing corporation in Slovenia.

Expectations

PURPOSE & CONTENT

General statements

EPCs are predominantly regarded an "administrative necessity".
Although there is recognition among some of the users, that conscious use of the EPC has the potential to influence various segments of real estate market positively, the general attitude – shared by both expert and general users – towards EPCs is generally negative, seeing it as an administrative necessity.

> **ES** *"The EPC appeared to ease the labour of classifying the existing stock of buildings and the new builds. It is a comparison tool then, I don´t expect it to give a very accurate description of the building but it is true that a quality control procedure could be implemented when they are issued to the administration. This is tricky as the software available lacks certain capabilities to ensure quality and representativeness."*

> **HU** The Hungarian informant pointed out, that they were selling an apartment just at the time of the U-CERT interview. There were 50 people expressed interest in the property, 9 people saw it, and 3 gave quotation for buying it, but none of them asked about the EPC.

Owners in contrast to tenants or temporary building users have a stronger sense of responsibility and attempt to engage with the field of energy performance of buildings more often.

> **SI** *"Tenant looks differently on these questions, he will care less."*

Reliability of measures related to energy performance of buildings will always be influenced by a variety of factors and attitudes.

> **SI** A Slovenian housing company rep. pointed out several factors that directly impact their work and indirectly also the performance of Energy performance of buildings measures:

- location,
- availability of information,
- stubborn characters of individuals,
- subjective nature of aesthetics,
- convenience,
- old and/or insufficient laws
- etc.

> > **SI** *"In this situations, individuals calculate what is in their best interest. In my opinion, the basic problem is, that there is no law that would regulate that, be it concerning property, housing, or business and other space. The existing law dates back to Yugoslavia times in the 70's."*

QUALITY

System related

Differences in attitudes and practice(s) are significant already on relatively short geographical distances.
In relation to the idea of comparability of EPCs and unification of EPC schemes across the EU it is important to note, that local specifics and differences are not obvious only on large distances. Already comparisons between regions, between cities and villages, or simply between different social contexts within the same locality create unique contexts, which influence realization of policies and schemes such as the EPC scheme.

SI The Slovenian rep. commented that there are considerable differences in how business and official procedures roll out in smaller towns in contrast with bigger towns.

> *"It is true, that we are a small environment and we all know each other. On the one hand this is bad, on the other it is an advantage. In Ljubljana this* [simple reciprocal arrangements based on trust] *can never happen. There are owners scattered all over the world, many owners that buy apartments following exclusively economic logic. When I talk to my business colleagues from Ljubljana they can't believe that we can actually come to some normal arrangements. There they have to stick to the law quite literally, but we really tend to work in the spirit of the law."*

Expertise related

Social and interpersonal relations are key.

SI The Slovenian rep. stated that interpersonal relations – trust, respect, reputation etc. – are factors that directly influence their day-to-day work. In terms of attitudes towards of schemes and initiatives for improvement of energy performance of buildings – and ultimately their success – these factors should be accounted for.

> *"Ninety five per cent of people are normal. With the other five per cent all of us have to deal with…"*

Needs

QUALITY

The next generation EPCs should be an upgrade of the existing EPCs and not a completely new tool.

NL The Dutch informant pointed out that it is important that the input needed for the certificate does not change too much. Housing corporations labelled their whole stock and what they do now is keep the labels up to date by changing the data when houses are changed. It would be a lot of work and cost a lot of resources to collect new data for all buildings if input parameters of the EPC changes.

ES Similarly, the Spanish rep. stated that capitalising on already existing tools is better than trying to search new ways of doing things. There is still margin to improve the current set of tools available in the market regarding calculation methodology, types of parameters and software development. In their point of view they stressed that this is the foundation of future EPC developments and that without reviewing the existing state of EPC schemes properly, the whole EPC initiative will be very little different from the current one in terms of its reliability and compatibility. They also stressed that a strong review should come before launching more EPC market related solutions, pointing clearly the way towards the correct/most evolved EPC procedure.

"I think we should focus on improving the tools already developed than promoting new ways of capitalising energy efficiency in buildings. If not the whole market will be based in wrong premises."

System related

Administrative procedures and legislation in line with purpose of EPC schemes.
There is a need to consider the role of existing legislation in individual MS to optimize both work of professionals and ensure good quality of Energy performance of buildings measures and EPCs. Many informants, including housing company rep's, were critical regarding existing administrative procedures and legislation concerning energy performance of buildings. They called for legislation that both supports and efficiently regulates EPC measures, claiming the existing system is complicated and hence negatively impact developments towards improved energy performance of buildings.

Better quality control.
Several informants, including housing company rep's, have emphasized the need for enhanced quality control of EPC schemes.

Expertise related

Connect different stakeholders in search for innovative business models.
Certification schemes are factually an ongoing process involving a large network of stakeholders of vested with particular structure inscribed in policies implemented by individual EU member states. Relations between these stakeholders should be revised and policies reconfigured to allow space in which interactions between stakeholders in pursuit of innovative business models would be fostered.

SI A housing company rep. from Slovenia relates their success of being one of the first and most successful SI municipalities in the field of Energy performance of buildings investments to a

simple fact that they connected with the right "people" at the right time. In their case, this was a bank open for innovative models of financing and monitoring of data using electronic banking software, which 10 years ago was quite innovative, he claims.

USER EXPERIENCE AND UTILITY

EPCs need to be user-friendly and user-centred.
Existing EPCs are largely expert oriented. Complexity of information and expert language included in the EPCs makes them incomprehensive for general users. In addition, information is presented in a way that general users find it hard to see any pragmatic use of the document. That diminishes effectiveness and value of both experts' work and the gross value-chain of EPC certification. Here are suggestions for potential improvements by housing companies:

The financial cost of EPCs and value they provide to all stakeholders needs to be balanced.
Housing company rep's noted that the existing cost of EPCs undermines the purpose and potential value of EPCs, which supports claims made by several experts. Such state negatively effects the certification scheme as a whole.

> **NL** The Dutch informant stated that by making the method more complex, the amount of information that needs to be collected grew and therefore certification became more expensive. As a result, the calculations are more detailed but in practice do not have any considerable impact on the calculation of the energy performance levels. For housing corporations, the cost of 200 EUR for the existing certificate is reasonable, he claimed.

EPC product

- Design –

Improved layout of information and revised structure of how buildings are described.
EPCs should be appealing and communicate meaningfully to both expert and non-experts.

> **HU** The Hungarian informant commented that the first two pages of the existing EPC are more or less clear, but the rest of the content is impossible to understand. EPC should have explanatory parts.

- Content and Utilities –

Provide more meaningful information for general users.
That includes contextualization of data and information provided in the document, for instance a good explanation of energy labels and provide users an idea about possibilities for investment with a transparent indication on returns on investments.

> **IT** An Italian informant stated that not all citizens are aware of what the energy class of a building really means. They are not yet aware of the fact that a higher energy class building can lead to cost savings over time. He believes that many users only think about short-term savings.

> **HU** A Hungarian informant pointed out, that non-expert summary must be part of the EPC. The most part of the existing EPC is for experts, therefore the EPC does not achieve its goal, so to give understandable information on the energy efficiency of the buildings and how to renovate. If new EPC will still leave the non-expert summary, nothing will be changed. The representative of the housing corporation recommends inclusion of one page summary for non-experts. Other users and experts advised also this solution.

Provide tailored indicators for professional users.
Depending on the business necessities in individual nation states, professional users have different needs and expectations.

> **NL** The Dutch informant pointed out that indication of CO2 savings would be a good addition to the certificate as this indicator is key in agreement with the local government. Other indicators on the label are not used by the housing corporations and the question is what they add. Also, one tool for new and existing houses is for the housing corporations very important: in the past a new house could get a not so good label, since not all new technology was taken into account for existing buildings. Measures on area level are less evident to consider for a label of a house.

EPCs need to function as a basic renovation guide (a roadmap).
Several informants noted that a list of energy saving measures in existing EPCs is insufficient. EPCs should include explicit information and necessary steps (a well-structured roadmap) towards higher energy performance.

Include examples of good (and bad) practices.
Both the aspect of comparison as well as knowledge and experience transfer were pointed out by several informants as one of the strong reference points for overall quality and impact of EPCs.

> **SI** The Slovenian informant claims, that their housing corporation was one of the first in Slovenia that pushed for systematic renovation of housing. They were also one of the first ones to issue EPCs for their renovated buildings, which served as an important reference point in persuading other people in the municipality to decide for investments into Energy performance of buildings measures.

EPC service

- Content and Utilities –

Build on connectivity – exchange of knowledge and experiences.

> **SI** A housing company rep. from Slovenia noted that exchange of information and experiences between neighbours proved as a key driver for motivating people for investing into Energy performance of buildings measures. Connectivity is beneficial also in terms of wide base support and quality of EPCs.

Taking measures for improving energy performance should be rewarded, but proportionally.

Several experts argued that that taking measures for improvement of energy performance of buildings should be actively supported. The impact of individual measures, however, should be taken into consideration and evaluated proportionally.

> **NL** The Dutch informant argued that taking measures should be rewarded, but with limits. As an example, he pointed out that the NTA8800 standard introduced in The Netherlands was too detailed. Housing companies succeeded to exclude parameters with less than 2% effect from being considered in the existing EPC methodology. However, they do find it important for the tool to provide representative values, which on complex level have some link with reality.

PUBLICITY

More positive publicity for EPCs.

Research shows that advertisement and public image of EPCs is very important and should be pursued systematically. This claim was voiced both by experts and general users in several EU member states.

ES The Spanish housing company rep. suggested to have more aggressive marketing campaigns where the EPCs are shown as the tool to be used to manage the basics of energy efficiency of buildings.

"Of course, a new and revised version of it. This could also trigger training and social events where new habits can be promoted between tenants and the population. Like living labs."

HU The Hungarian informant claimed that awareness of people on energy efficiency should be changed by national marketing campaigns. The campaign should be implemented quarterly on TV and radio channels. The aim will be to raise people's awareness on the energy efficiency of their buildings, and a tool for this purpose can be the EPC.

Public and private investors

Key role: Clients, beneficiaries and influencers.
Key motive/interest: Investment (business) opportunities.
Key insights: Aspects related with cost/financial effectiveness of EPCs.

Representatives of institutions and businesses whose core focus is quality and value of buildings. They have an interest in investments with best return, while the return can be measured differently – from indirect financial return to long term business credibility and service quality returns. They have a good insight into possibilities and barriers for EPCs related business opportunities.

U-CERT reference ● *Have the need for holistic and above all reliable certification schemes to justify investments, e.g. for deep renovation; giving a clear view on real performances and on the market value of buildings going beyond classical savings – investment to more holistic CBA integrating IEQ and health.*

U-CERT will link the EVCS with existing (or under development) voluntary holistic environmental schemes, and add indicators related to health and well-being based (e.g.) on prEN 16798 to assess indoor air quality and comfort in the scope of deep renovation. Improved indoor environment has also an impact on the market value of buildings. The U-CERT holistic EPC as to be developed in WP2.

Informants' background by countries ●

BG Municipal energy manager with more than 15 years of practice.

ES The head of an advisory company dedicated to managing private investments on the real state market.

HU Representative of a project development and construction company, who has great expertise in commercial property development.

IT Engineer and ESCO.

SI #1 The head Energy manager for a major SI municipality

#2 Sales and Energy Management Director for a major SI energy and ESCO company.

Expectations

PURPOSE & CONTENT

General statements

EPCs are predominantly regarded an "administrative necessity".
This perspective on existing EPC schemes is largely shared by both expert and general users.

> **ES** The Spanish rep. claims that EPCs have had virtually no impact on the real estate market in Spain and that it is just an administrative procedure.

> **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."*

QUALITY

The value of the EPC should be reflected in its price.

> **HU** The Hungarian informant pointed out, that the certificate should have much more power and that it should be represent in its price. In relation to his understanding of valuable EPCs, he called for:

- EPC with better quality,
- EPCs based on more precise calculation,
- EPCs harmonized with the real energy consumption, in order to be reliable.
- EPSs including measures for better operation of the building and HVAC systems (useful for building owners/operators)
- Appropriate sanctioning of certificates of inadequate quality is also necessary.

USER EXPERIENCE AND UTILITY

EPC service

- Design –

Future EPCs should go digital.

> **IT** The Italian informant firmly believes that expanding the concept of EPCs with digital elements, such as a website or an app, would make EPCs considerably more useful.

- Content and Utilities –

EPCs should be an educational tool.
Several informants claimed that EPCs should educate their user how to use the building suitably regarding its current technical properties and physical condition.

> **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."

Needs

QUALITY

Method related

Provide a reliable and rigorous method.
Several informants pointed out, that EPCs, even if they are based on standard requirements, should assure the results are correct and follow a certain level of accuracy compared to the actual condition of the property. Here are some other method related suggestions.

- **Integrate EPCs with digital tools.** The Italian informant suggested to include information portals and building mapping as well as integration with LCA / LCC and sustainability.
- **Improve the energy calculation method.**
  HU The Hungarian informant claimed that results of the calculations on the energy use of cooling system are very far from reality. The heat recovery in the ventilation system and the performance factors of cooling equipment are not properly taken into account in the present calculation method.
- **Include CO_2 emission as statistical data.** The Hungarian informant stated that calculated CO_2 emission could be included in the EPCs for statistical purposes.

System related

Need for a register of certified issuers.

IT Several Italian informants suggested that a transparent register of certifiers would be an important positive addition to the EPC field.

Expertise related

Enshrine Energy efficiency into the business culture of construction sector.

ES The Spanish rep. claimed that construction sector should comply with the energy efficiency requirements not only with a label, but with a clear roadmap towards professionalization and energy efficiency awareness and promotion.

Need for new business opportunities.

SI The Slovenian private investor rep. strongly argued for new business opportunities and models – such as energy performance contracting – being included and promoted in the context of EPC schemes.

USER EXPERIENCE AND UTILITY

EPCs need to be user-friendly and user-centred.
Existing EPCs are largely expert oriented. Complexity of information and expert language included in the EPCs makes them incomprehensive for general users. In addition, information is presented in a way that general users find it hard to see any pragmatic use of the document. That diminishes effectiveness and value of both experts' work and the gross value-chain of EPC certification. Here are suggestions for potential improvements by the public and private investors:

The average user needs more useful information.
Several informants pointed out, that general users do not understand much of the EPCs. Here are some related suggestions by rep's of public and private investors:

EPC product

- Design –

- **Language should be more attractive and inclusive for non-experts.**
- **A simplified version of EPCs for general users.** The Italian informant suggested that use of a simple single-page EPC format would be more understandable for users and have more impact.

- Content and Utilities –

- **Transparent (regulated) pricing.** The Italian informant suggested EPCs to include national price list, in order to avoid speculations.
- **Demonstrate value**. EPCs should demonstrate value transparently and meaningfully. This includes presenting users with aspects of IEQ, connect the EPCs with other key aspects of housing qualities and puting special focus on communicating the value of EPCs efficiently.
- **Pragmatic focus.** Spanish rep. claims that future EPCs should communicate a more practical vision about how to implement the energy saving measures and their impact on the economy as well as incisively communicate potential impacts of renovating property following the criteria for energy efficiency.
- **Provide specific renovation measures.** The Hungarian informant stated, that economic data related to the proposed renovations would be useful information for the average user, determining energy cost savings, estimated investment cost and return of investment (ROI). At least, the estimated ROI is necessary to be presented in order to orient the user to the right direction.
- **Provide finance-related information**. The Hungarian informant claimed that it is very important to give economic data as well, such as return of investment of the proposed measures.

EPCs should include both absolute and relative indicators.
Relying exclusively on absolute indicators (values) included in the current EPCs can be misleading, several informants argued. 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, cultural and historical value etc.

> **SI** A Slovenian public investor rep. pointed out that old and historic buildings will always be a case where existing EPCs will cast a negative image and argued that that there should be a different categorisation /grading scale for such buildings – accounting for limitations in renovation possibilities but acknowledging measures, such as use of renewable energy sources.

"I think, that it 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."

EPC service

- Design –

Omit the unnecessary and unreasonable requirements.

SI The Slovenian rep. pointed out, that EPCs – under current Slovenian policy – have to be displayed on a public location, yet there is no reasonable explanation available why this is required. In their view, publicly displayed EPCs in the existing format have no considerable impact whatsoever. For such cases, reasonable explanations should be provided or the requirement should be omitted.

EPC should be a tool for regular energy performance assessment.

HU The Hungarian informant pointed out that there can be significant deviations from actual energy consumption data in the results of the current calculation. An energy model should be used that is suitable for fitting to real data after calibration. Deviation from real energy consumption should be e.g. ± 10%. 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.

- Content and Utilities –

Minimize the cost-benefit gap.

Alternative strategies to create value for owners are needed for cases where the existing EPCs present nothing more than costs.

Alternative labelling for buildings under heritage protection.

SI The Slovenian rep. claimed that certain buildings, especially ones under historic protection, have no prospect of being retrofitted in a cost-effective manner. These cases should be presented with alterative options for the following aspects:

- An indicator of building's relative efficiency given its condition (age, materials used etc.),
- status (historical building, considerations of its immediate surroundings),
- and alternative ways to financially justify the investment into issuing EPCs.

Integrate EPC schemes with educational content.

SI A Slovenian rep. claimed that educational contents on energy performance of buildings can and already is being included in their work. They provided a positive example from an energy performance contracting case Energy Retrofit Programme of Public Buildings in Ljubljana (see https://srip-circular-economy.eu/project/energy-retrofit-programme-of-public-buildings-in-ljubljana-eol-1/), which incorporated educational content for users – specially designed stickers and posters for schools. These educational contents were financed by financial savings made by the renovation.

PUBLICITY

More positive publicity for EPCs.
Research shows that advertisement and public image of EPCs is very important and should be pursued systematically. This claim was voiced both by experts and general users in several EU member states.

> **ES** The Spanish rep. called for a very intense marketing campaign to promote EPCs' relation to energy efficiency and associated tools.

MISC

Commissioning in connection with EPC.

> **HU** The Hungarian informant suggested commissioning process could also appear in connection with the EPC. For example, in the case of office buildings, the energy model on which the certification is based could be tuned 1 year after certification.

Involved craftsmen

Key role: Users and beneficiaries.
Key motive/interest: Business opportunities & guidelines for work.
Key insights: Insights into EPCs related balance of theory and practice.

Craftsmen have a particularly interesting insight into conflicts of theory and practice related with building and renovation projects. Being on the frontline of physical realisation of projects, they encounter challenges such as lack – or excess – of expert supervision and leadership, competitive and illegitimate market practices, pressure from an array of particular interests by involved individuals and stakeholder groups, etc. Through their hands-on experience, they also have a good understanding of challenges and possible drivers of changing markets and policies. Their insight is particularly valuable for understanding challenges related to transfer of planning and design from theory into practice.

U-CERT reference ● *Craftsman have a dominating role in the realization of the final quality of construction and renovation. Trained and full skilled/qualified craftsmen will support the reliability and trust worthiness of EPC's and assessments*

Informants' background by countries ●

ES Electrician Engineer with extensive experience in the construction sector, the Head of its own company.

FR Self-employed plumber and heating engineer.

HU Representatives of 2 successful HU construction companies.

NL Innovation consultant working for a large Dutch construction company.

SI Head of a successful SI construction company.

Expectations

PURPOSE & CONTENT

General statements

EPCs are *not* key in the context of systematic pursuit for energy efficient buildings.

ES A Spanish rep. claims existing EPCs are of lesser importance in terms of systematically influencing energy performance of buildings. In his opinion, the key challenge is to impose an effective regulatory framework on the building sector that will push private companies to be more ambitious with regard to energy efficiency with the product they offer.

The broad field of Energy performance in buildings in Slovenia is well-covered.

SI The Slovenian informant claims that through services of the Eco-Fund (a government funded scheme in support of energy efficient investments, including building renovations and nZEB construction) Slovenia has a relatively good system for support of energy efficient measures in buildings. They indicated some possibilities for improvement following examples from other EU countries such as Germany, however without concrete references or suggestions.

QUALITY

General expectations regarding the qualities of future EPCs.

- More accurate and reliable EPCs,
- An ambitious regulatory framework,
- Need for good quality and efficient software tools able to present factual condition of the buildings,
- Redesigned document with capacity to affect the construction sector and real estate market in a positive way,
- EPCs that promote awareness and create a sense of social consciousness with regard to the current circumstances.

The field of energy performance of buildings is constantly evolving.

SI The Slovenian informant pointed out the following aspects that concerns their business in relation to the future developments in the field of energy performance of building:

- Well educated and experienced experts,
- New materials,
- Positively-orientated projects,
- Good business relations with customers, partners and suppliers.

Method related

Future EPCs should be synchronised with the existing technologies.

FR The French informant commented that EPCs can only be reliable if the tools (technologies) implemented in the existing housing stock are also upgraded. The installations he is currently carrying out do not allow for proper counting. To do this, the technical and home

automation equipment of the building would also have to evolve.

Expertise related

Building managers are key stakeholders in the context of energy performance of public buildings.

SI Regarding public buildings and blocks of flats, the Slovenian informant pointed out building managers as the key players regarding Energy performance of buildings investments. He added that they are also often the source of problems, such as illegitimate business practices – asking for investment percentages and bribes from companies bidding for business.

MISC

The primary energy factors can hide the building structures' energy performance.

HU The Hungarian informant pointed out, that extremely low or high primary energy factors of district heating systems (or other energy sources as well) can hide the energy performance of the building structures. This can cause misunderstandings, because lay people usually connects the energy class with the delivered energy use, but good energy class does not always results in low delivered energy use.

Needs

QUALITY

Method related

Account for discrepancy between theory and practice and provide realistic information.
Craftsmen pointed out that EPCs should be much more realistic in how they communicate to their users. Unrealistic information both fails to educate users and provides false and ultimately useless information.

The existing EPC methods should be improved.

> **HU** Hungarian informant claimed that calculations should only be performed by using country-standardized software. The input data required for the calculation should be from the digital geometric model of the building, not manually entered values, thus making it easier to check the input data (e.g. surfaces, thermal bridge correction factor). It requires more time and resources from EPC issuers, so it will increase costs of EPCs.

EPCs should provide advice beyond improvement of energy efficiency.
Standard measures suggested for improvement of energy performance of buildings are not necessarily in line with other aspects of housing quality corresponding to aspects of IEQ, comfort, convenience etc.

> **FR** The French informant noted that he would not want the houses to be made any tighter than they are now. Airtightness of a house puts a lot of pressure on him and is not always respected by everyone. He also questioned its relevance.
>
> *"We had a case recently where the ventilation broke down in a client's house. The client was away on holiday for two weeks. When they came back the house was full of mould."*

Include monitoring (track history) of the energy renovation projects.
Several informants expressed the need for more accurate monitoring of the impact of energy developments through a more transparent, accurate EPC system.

Presentation of limits of the energy classes.

> **HU** The Hungarian informant suggested presenting the relationship between energy classes (A, B, C,...) in a transparent way on the front page of the EPC. In other words, the limits of the energy classes should be shown in the pictogram, which demonstrates the energy classes and which energy class is achieved.

System related

Need for balance between cost and quality of EPC products and services.
Several experts pointed out, that the quality of EPC products and services is strongly related to their price. They argue that it should reflect the value of expertise required for its production. If the price is too low, the quality of services is likely to be proportionally lower. On the other hand, if the price is too high to justify the value it delivers, people will not support EPCs.

Explicit responsibility of issuers for the quality of their work.

ES A Spanish rep. suggested that quality – in terms of accuracy and efficiency – of EPCs would rise if experts were responsible for the certificates they issue and its impacts.

USER EXPERIENCE AND UTILITY

EPC product

- Design –

EPCs need to be user-friendly and user-centred.
Existing EPCs are largely expert oriented. Complexity of information and expert language included in the EPCs makes them incomprehensive for general users. In addition, information is presented in a way that general users find it hard to see any pragmatic use of the document. That diminishes effectiveness and value of both experts' work and the gross value-chain of EPC certification. Here are suggestions for potential improvements by housing companies:

- **Provide various levels of EPCs** offering different complexity of information corresponding to the background knowledge, interests, and needs of various user profiles.
- **Put most important information first.**

  HU The Hungarian informant stated that most important parts of EPC should be on the front page or max at the 2nd page. Calculated annual delivered energy consumption and energy costs could also be included on the front page in connection with the existing condition and energy saving measures, of course with detailing the boundary conditions.

- Content and Utilities –

The EPC must provide a transparent and relatable reference with regard to estimated costs and savings.

FR A French informant pointed out the existing EPCs provide poor estimate of energy costs. These only take into account heating, DHW and cooling; distorts the perception of users. As a result, he finds himself having to justify the good set-up of the installations by the fact that his client's energy bill is higher than the one announced by the EPC.

Include predicted energy cost savings of measures.

HU The Hungarian informant believes that EPC could help and motivate users in decision making for renovation if it includes data that people find meaningful, such as predicted energy cost savings of the proposed measures.

Educate end users.
Several informants claimed that people are more likely to support EPC if they will be able to understand it. The basic knowledge regarding EPC should be meaningfully transferred to non-experts through specially designed educational contents.

EPC service

- Content and Utilities –

Enable easy access to the EPC register.
Several informants complained about a complicated access to EPC database in their home countries.

> **HU** The registering database of EPCs in Hungary is public, however very few lay people knows the link, where the EPCs are available. Furthermore, in this database the user can only see the address and the energy class of the EPC, but nothing else. The energy consumption, the proposed renovation measures, etc. should be also available in the EPC database.

Demonstrate value of EPCs also for the involved craftsmen.

> **SI** A Slovenian rep. highlighted that educated young craftsmen are the company's biggest asset. In this respect, presenting (or educating) them about information presented in the EPCs could be mutually beneficial for both quality of their service as well as quality of EPC schemes.

Demonstrate a correlation between successful energy performance measures and quality service provided by craftsmen.
EPC schemes should account for the fact that quality of service – construction and refurbishment – has an impact on financial implications of measures presented in the EPCs.

> **NL** The Dutch informant stated that performance guarantees will become more important. Therefore, the link between EPCs and actual performances becomes more important, and also comfort should be taken into account.

Integrate EPCs with strategies to fight against illegitimate business practices.

> **SI** Several informants from Slovenia indicated that illegitimate business practices are part of construction business – the broader field of EPC schemes, which causes 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.

PUBLICITY

Need for systematic promotion and marketing

> **HU** The Hungarian informant pointed out, that EPC contains a lot of useful data to prepare a renovation project, however people usually do not know about it, only if they sell or buy a house. He suggests a central (state) measure to promote EPC more widely. He stressed the need to highlight the relation between the EPCs and the individual and social benefits and the economic and environmental impacts of energy developments in a series of campaigns capitalizing on presenting best practices.

Building professionals (architects and engineers, facility managers, designers, installers, commissioners)

Key role: Users and beneficiaries.
Key motive/interest: Business opportunity and related aspects.
Key insights: Insight into EPCs related balance of theory and practice.

Similarly as craftsmen, building professionals have a good insight into conflicts of theory and practice on various levels and a good understanding of market and/or policy related challenges and drivers. Although their work is often closely related to EPCs and they are able to identify problems, they do not necessarily have a concrete idea about how the next generation EPCs could have a significantly different or positive impact on the fields of their expertise. They have the advantage of understanding connections between entrepreneurial, regulatory (policy related) and practical issues.

U-CERT reference ● *Lack information about how the building is performing in reality and what are the use patterns.*

The U-CERT Building Operational Rating solution would /…/ create a valuable feedback loop for improving the quality of services offered by building designers and contractors. Moreover, building professionals could develop new services, benefit of closer and more frequent contact with their clients and prepare for the future market shift from products to services.

Informants' background by countries ●

BG #1 Building designer – HVAC.

#2 Vastly experienced building designer - architect, chair of an NGO.

#3 Building designers - architects, owners of design studio.

ES #1 An architect with extensive experience in the building sector.

#2 An architect with a viewpoint of housing rehabilitation.

#3 An engineer with a viewpoint of university building management.

FR #1 A thermal engineer in charge of a design office.

#2 Project leader in a technical and environmental building centre, focus group participant.

#3 A 2nd year student of civil engineering – next generation of EPC issuers' representative.

HU #1 Leader HVAC designer of a famous HVAC designer company.

#2 Representative of a big installer company.

IT An architect who works in a little studio; four engineers who work in different companies.

NL Engineer and senior consultant.

SI #1 A representative of an investments office at a large public institution.

#2 Head of a successful SI company for holistic building planning.

Expectations

PURPOSE & CONTENT

General statements

EPCs' purpose is to bring energy closer to people and make energy more intuitive.
Most informants agreed that EPCs should be easier to understand for all users. Moreover, non-experts should be actively involved in the certification process.

> **SI** *"The purpose of this 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."*

Simultaneously, however, most informants acknowledged that people tend to find the existing EPCs difficult to understand and use.

> **HU** The Hungarian informant stated that 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.

EPCs are regarded an administrative necessity.
This perspective is largely shared between both general and expert users.

> **SI** A comment by a Slovenian real estate broker: *"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 payed 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."*
>
> **ES** *"While they are conceived only as an administrative document, I don´t expect them to have a real impact on the construction sector. It should be more reliable and controlled under a strict procedure."*
>
> **BG** The Bulgarian contributors provide an interesting observation, pointing out that EPCs are sometimes *not recognized* as a necessity or a regulatory obligation. That, however, is not as much a reflection of qualities of their EPCs or EPC scheme as it is an indicator of lack of knowledge and absence of mechanisms to guide the investment process with consideration of energy efficiency issues.
>
> > *"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."*
>
> Here are some contextual notes:
>
> - For several building professionals learning that EPCs are obligatory for buildings over 250 sq.m was a surprise.
> - Only commercial and public building owners are aware of the regulations, but it is accepted

that there is no control on compliance.

There expectations for the future EPCs are highly varied.
Some informants believe the existing EPC scheme is sufficient. Other, however, believe that future EPCs will and should evolve to include a variety of reference data and information tailored to the needs of the users. They foresee such development, particularly informing users of the impact of their actions and enabling them better control, is expected to be a motivating factor.

BG The Bulgarian informants pointed out that there are no expectation from their informants regarding the development of the auditing methodology or the EPC itself.

"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."

Some positive features of the existing EPCs as described by Bulgarian informants are:

- Information about the use of energy and the energy class.
- Suggested renovation measures and recommendations for improvements of the building components and systems.
- Cost efficiency calculation.
- Comparison between pre- and post-renovation energy use.
- It provides an overview of the building's energy performance status.

HU The Hungarian informant claimed that a paradigm changing is necessary. People should be educated that the EPC is a valuable document on the energy performance of their buildings/building units. People should have the EPC made, not because it is mandatory, but because it is important to know the energy efficiency of the building and what the energy saving possibilities are.

QUALITY

Method related

EPCs and Energy audits are two different things.

FR A French informant argued that EPCs should be kept distinct from energy audits, saying EPCs are not meant to be as in-depth study of buildings as energy audits.

System related

Standardization of rules, better regulation, and efficient policy.
Several experts expect certifying bodies that will ensure standardization of regulation across the EU and secure "an ambitious regulatory framework" forcing the market to improve the overall building quality in terms of energy efficiency.

FR A French informant claimed that EPCs should "perform a double check", which is to have a regulatory function before and after the construction. Firstly, at the moment of acquiring the building permit to check if building is adequately designed to conform with existing energy performance regulation. Secondly after the construction, to confirm that a building has been constructed in line with the initial plans.

Expertise related

Quality of EPCs reflects the quality of issuers' work.
Several informants attributed the poor quality of EPCs with poor competences of EPC issuers.

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

USER EXPERIENCE AND UTILITY

Despite obvious benefits (e.g. calculated savings, ROI), EPCs are generally regarded as having limited practical value.
Several informants highlighted that existing EPCs largely fail to deliver value beyond statistical information and measured data. In practice, their cost-benefit ratio provides poor value for users. Most general users are unaware of the application or usefulness of EPCs.

> **BG** The Bulgarian informant pointed out building designers as an exception, which base their work on the recommendations of the energy audit (which are reflected in the EPCs of existing buildings before renovation). Other users make little or no use of EPCs whatsoever.
>
> *"The certificates could have a positive impact mainly on the renovation of the building systems, as far as I am concerned. People are however interested only if they are legally required to have certificates."*
>
> *„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."*

Value of existing EPCs is predominantly and exclusively associated with complying with legal requirements.
This relates to the fact, that EPCs are regulatory condition – an administrative necessity – for either accessing funding (subsidies or grants) or being able to sell property.

> **BG** As an illustration, Bulgarian contributors referenced an established practice in Bulgaria, where international investors are identified as leading motivation to issue EPCs. Making EPCs a condition to access funding, attract investments, or procure other financial support is a hazard to perpetuate the view of EPCs as "administrative necessity." Nonetheless, this observation indicates that value of EPCs often emerges in relation to aspects that go beyond the content of existing EPCs.
>
> *"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."*

EPC product

- Content and Utilities –

EPC need to promote holistic building retrofitting.
Several professionals noted that buildings are complex entities and that improvements often have to be made holistically (deep renovation). In this regard, EPCs should not simply promote renovation but do so in a holistic manner.

> **SI** *"If you have to do a static rehabilitation of a building, and you don't do it before you do the energy retrofit of the building envelope, you have double work at the end."*
>
> **HU** The Hungarian informant stated that the EPC would be more useful for users if they would contain more specific data suggested measures, which they could use to get quotation from contractor.

Some other general expectations voiced by various building professionals regarding content and utilities of future EPC products and services include:

- **The EPCs will add new services to become attractive for investors.** The need to promote a more complex energy consultancy service will unite a broader circle of stakeholders interested to reap benefits from the developing market.
- **The EPC should guide the renovation process.** It is expected that the information included in the EPC should be used to monitor the renovation and the consumption.
- **The EPC should be integrated into the market**. The EPC should become an integral part of the market and should lead to benefits to the owner, depending on the achieved energy class.
- **Comfort and health, including IEQ, should be decisive factors.** Some expert users suggest that information about the internal microclimate should be included in future EPCs since it is closely connected with quality of living and health.

Segmentation of content is considered useful.

> **ES** A Spanish informant suggested that having data for heating, cooling, DWH, and lighting since is useful as it allows methodical focus on possible improvement measures. Similarly, having ratings for demand and consumption separate indicates how the architecture of the building is resolved before including the facilities.
>
> > *"It would be interesting to know the performance of the building, with each individualized installation to know where to improve."*
>
> Our contributors, however, noted that the energy performance evaluation is based on the interactions between the passive elements of the building, its systems, occupation and operation. Although knowing the specs for each individual part of the system is always useful, such segmentation analysis does not necessarily enable better understanding of buildings' energy performance. The existing Spanish EPC already shows the specs of the envelope and structural elements, the architecture of the building, as well as energy demand and consumption. In this respect, a potential improvement would be to detect parts of the system delivering poor performance and/or with potential for improvement and including them in the EPCs, clearly indicating a correlation with the ESM (Energy Saving Measured).

Needs

PURPOSE & CONTENT

EU-MS divide

EU-wide comparability.

> **HU** Hungarian informant pointed out, that engineers sometimes use to work on buildings outside from their home country. In this case, it would be good to use a common energy certification method in order to ease the flow of the work.

A common EU database and parameters.

> **ES** A Spanish informant claims that existing database focusing on individual countries not sufficient.

Expert-user divide

Consider building professionals as a vector of value of EPC products and services.
It is necessary to educate, involve, and motivate different professional in the building sector – architects, property managers, real estate brokers etc. – to promote EPC-related services.

> **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."*

QUALITY

Method related

Improve the certification software.

> **ES** The Spanish informant stated that certifying software should be able to run actual energy performance conditions simulations.

Fix/explain discrepancies in calculation methodology.

> **ES** A Spanish professional noted that despite the fairly good analytical qualities of existing EPC 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.

Integrate EPCs with new technologies, such as smart meters.

> **NL** The Dutch informant claims that extensive deployment of smart meters will allow to make more "tailored" EPC, based not only on the building energy performance, but specifically representing energy use patterns varying from building occupants.

System related

Knowledge transfers should be "institutionalized".

SI A Slovenian facility manager emphasized the need to integrate elements of education and knowledge transfer in the concept of future EPC schemes.

Integrate new EPC methodology with alternative data sources.

SI A building professional from Slovenia noted that existing EPCs source their data with owners and users of housing, but not from databases of big energy providers.

"A question no one dares to ask is why doesn't anyone ask for energy-use data at energy providers? Why is this in the domain of the user or owner of the building? It's nonsense."

Reduce the period of EPCs' validity.

FR The French informant pointed out that EPCs should not be valid for 10 years, as they are at the moment, but to decrease this period according to the individual building to control and track changes in buildings' condition.

The financial cost of EPCs and value they provide to all stakeholders needs to be balanced.
As other experts, building professionals pointed out that the issuing price of existing EPCs is too low, which has detrimental effect on the certification scheme as a whole.

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"*

EPC should promote low-carbon products.

FR A French informant argued that developers of future EPCs should take the Carbon data sheet of products into consideration. Building experts need the EPC to support efforts to reduce carbon emissions from housing products.

Build capacity to accommodate change and show connections between future regulation and new EPCs.
Several informants indicated the need for future EPCs to have the capacity to accommodate change both from technical (integration of new technologies and tools) and conceptual (integration of new parameters and contents) points of view.

FR A French informant highlighted the experts' need for a link or a clear connection of environmental side provided by future thermal studies (with LCA) and regulation with the EPC. They need to be able to added value environmental studies to the client during a transaction or according to the classification of the property

Expertise related

Access to quality advice and service providers.
The vast majority of general users has little or no expert knowledge. Several informants noted this as one of the key reasons why existing EPCs fail to deliver value to their users.

BG A Bulgarian informant argued that users should not only have access to a trusted source providing reliable and unbiased information regarding existing supply of consultancy services, but also be guided throughout the process of certification.

„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."

USER EXPERIENCE AND UTILITY

EPC product

- Design –

The EPC must clearly indicate buildings with intolerably poor energy efficiency.

> **FR** A French informant pointed out that buildings in France diagnosed as "energy sieves" – EPC labels F or G which are considered as buildings with intolerably poor energy efficiency – are legally required for refurbishment. In this respect, they suggested EPCs should clearly identify such cases to raise awareness.

EPCs need to be user-friendly and user-centred.
Existing EPCs are largely expert oriented. Complexity of information and expert language included in the EPCs makes them incomprehensive for general users. In addition, information is presented in a way that general users find it hard to see any pragmatic use of the document. That diminishes effectiveness and value of both experts' work and the gross value-chain of EPC certification. Here are suggestions for potential improvements by building professionals:

- **Make EPCs comprehensive.** Not only general users, but also some professionals seem to have difficulties understanding the content provided by existing EPCs.
  > **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."*
  > **ES** *"The energy demand part is not very well explained but it is good that it appears."*
  > **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."*
- **Improve the design (user-interface) of the EPCs.** Layout of the EPCs should be redesigned with more attention to user interaction and relevance of information depending on user's background knowledge and interest.
  - **Enhance visualisation.** An Italian engineer has referred to visual elements of the existing EPCs as "old-fashioned" and claimed that better graphic representation of EPCs would have a positive impact on the overall quality of EPCs, especially for general users.
  - **Provide an introduction or reference table at the beginning of the EPCs.** Several informants suggested that EPCs need some sort of signposting and potentially a glossary of terminology (a key) on the first page to improve the reader's interaction with it.
    > **HU** Several Hungarian building professionals recommend to include glossary, legend and a written summary in an understandable way for lay people on the existing conditions too, not only about the energy saving measures. These would help the user to understand the EPC.

- Content and Utilities –

Improve practical value of EPCs.
Similarly as general users, several building professionals argued that existing EPCs offer poor practical value for both users and experts. What is more, several professionals – including large facility managers – said they do not use the EPC at all. Some suggestions addressing this issue include:

- **Provide track history of renovations/maintenance.**

- **Enable real-time user feedback.** A Spanish informant suggested that user ratings could improve defining improvement opportunities in the facilities.
- **Enable (real-time) feedback from the monitoring system.** Clear articulation of the relative operative efficiency or impact of taken measures for individual buildings and maintenance personnel. This is related to the tracking of smart readiness parameters (SRI).

More attention to energy-use factors which users can control directly on a daily basis.

BG The consumption of different appliances and systems is deemed to be of interest to the end user, the Bulgarian informants claim. Information about the building characteristics is not needed daily, but energy consumption is a daily issue and tracking it – potentially by an EPC-integrated monitoring tool – could have a considerable impact on efficient energy use.

SI Concretely, a building professional from Slovenia suggested that electricity and natural gas are two key factors, which individual users can actually control on daily basis.

„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."

Including parts of SRI into the EPC should be relevant for big buildings and especially for new constructions.

HU A Hungarian informant pointed out, that knowing SRI of building units, especially in apartments in a block of flats, probably does not provide benefit to the individual owners and/or users of housing units. The user has very limited possibilities to influence on the smart readiness of 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.).

Provide more indicators.

Many experts suggested that good indicators are invaluable tools for getting people actively involved with the renovation. Here are some most commonly mentioned:

- **Financial indicators –** costs, correlation of measures and user-practices with energy costs (indicated in EUR), transparent indicators for assessing the balance of costs and benefits.

  Building professionals pointed out there is no clear, transparent indicators of how EPCs could financially benefit individual investors. The implicit potential for financial savings in the existing EPCs is not persuasive enough for general users. In order to improve the rate of certifications and people's attitudes towards them, economic incentive tends to play a key role and should be explicitly demonstrated.
- **IEQ –** indicators of comfort, correlation between energy efficiency and comfort.
- **Condition indicator** - the existing condition of the property, including its structural condition and its systems.
- **Occupancy indicators** – Indicate correlation between occupancy (number of occupants/users and user type) and performance levels.
- **Real-time energy performance indicators** – indicate (and contextualize) real-time energy performance of the building in comparison with the calculated EPC values. This includes both IEQ and energy performance as well as the possibility to follow the balance between energy use and cost.

  BG Bulgarian informants suggested that given sufficient real-time information, users would be able to control their electricity usage more efficiently.

Provide meaningful comparison indicators.

Providing indicators that provide a meaningful comparative reference point proved to be one of the most commonly shared ideas among our informants. Here are a couple of suggestions.

- **Comparison with (contextualized) average values of energy performance.** Provide context – reference points such as average energy costs, legally required minimal standards, and other contextualized comparable data.

  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."*

  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."*

- **Performance comparison with other buildings/dwellings in the same energy class.**

  BG *„The question 'Where do I stay compared to others?' has the potential to unlock the initiative and provoke the interest towards the EPC."*

- **Reliable (and potentially responsive) indicator of cost comparison.** People are interested in how much more/less they pay for energy compared to other users in comparable buildings.

  BG *"I think very few non-specialists have information about building components. The experts do it superficially – well, I have 10 cm of insulation, so it should be fine. For me, this information could be extremely valuable and it could be a driving force for the behaviour of the user. Because sooner or later, you come to the point to renovate your house. And you want to do it all at once."*

  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."*

  HU A Hungarian informant stated that people understand energy cost and not primary energy consumption. Primary energy consumption is hard to understand for lay people, therefore the calculated delivered energy use and its cost should be included also.

Provide unambiguous, well-defined, and case specific measures.

Several informants pointed out, that measures proposed in existing EPCs tend to be poorly defined and generalized.

SI *"…* [measures included in the 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."*

HU The Hungarian informant called for more data regarding the proposed measures, e.g. number and sizes of each windows and doors. In his view this will facilitate design and implementation of the proposed measures.

Minimize the cost-benefit gap.
Building professionals once more highlighted the need for alternative strategies for creating value in cases where the existing EPCs present nothing more than costs.

> **SI** One of the Slovenian informants provided an example of an old school gymnasium building. Their calculations showed that any standard investment into improvement of the building would resulted in higher running and maintenance costs in comparison to the existing condition. As such, the office cannot get subsidies from the state and will likely keep maintaining the existing state indeterminately.

> **FR** A French informant suggested to integrate EPCs with all possible financing opportunities (state financial aid) that clients ordering EPCs could benefit from**.**

Adapt the use of EPCs for building maintenance.
There is a need to better associate the conditions of the building components and systems to the required action from the owners and managers.

> **IT** An Italian informant suggested to target specific problems (weaknesses) of buildings that would lead experts to define efficient problem-specific sets of energy saving measures.

Highlight the carbon emission as an indicator of good performance.

> **FR** A French expert suggested to integrate EPCs with the "carbon challenge" in a simple way. He belies that highlighting carbon emissions has the potential to enhance the value of the property in a transaction.

EPC service

- Design –

Omit the unnecessary and unreasonable requirements.

> **SI** Some Slovenian experts noted that the existing Slovenian legislation includes "unnecessary requirements" such as displaying the EPC on a public location.

Enable connectivity and recognise good practices.
In addition to interactions between experts and users, informants suggest to integrate EPCs with a system for recognising individuals (or institutions) that do well at managing the Energy performance of buildings and reach a relative maximum level of efficiency. In addition, they suggest a systematic approach to encouragement of others to follow the examples.

Enable easy access to EPCs for everyone – experts, owners, tenants, and building users.
Our research indicates that access to an EPC database is not easily accessible in all of the EU countries.

> **FR** A French informant pointed out that tenants in France do not always have access to EPCs of the housing units they are renting.
>
> *"If I take my own experience as an example. When I rented my apartment for my studies, I went through the landlord directly. I never had access to the EPC. There was no way to check the energy value of the property."*

- Content and Utilities –

EPCs need to provide realistic consumption estimates.
Several informants pointed out that existing EPCs do not always provide realistic consumption estimates, which has an impact on people's attitudes towards the EPCs.

Support meaningful interaction between end users and experts.
People need to understand the purpose and benefits of EPCs and related policies. Better communication is a key step towards making future EPCs more user-oriented and less of an "administrative necessity".

Need for systematic knowledge transfer and education.
Many informants highlighted the need to raise general awareness about EPCs and stressed the role of knowledge and experience in this regard. Following are some suggestions and ideas on how to transfer knowledge:

- Through the person issuing the EPC.
- Through educational contents, possibly as early as primary schools.
- Through games and gamified features.

> **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."*

> **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."*

PUBLICITY

More positive publicity for EPCs.
Research shows that advertisement and public image of EPCs is very important and should be pursued systematically. This claim was voiced both by experts and general users in several EU member states.

> **IT** Italian professionals highlighted that upon making the schemes much more usable and "attractive", positive advertising is extremely important.

U-CERT

User-Centred Energy Performance Assessment and Certification

OUR TEAM

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