



**D2.5 U-CERT
Guidelines:
recommendations
for harmonized,
holistic and user-
centred EPCs**



This project has received funding from the European Union's Horizon 2020 research and innovation programme under the grant agreement number 839937. The European Union is not liable for any use that may be made of the information contained in this document, which is merely representing the authors' view.

Table of Contents

1. Executive summary.....	3
2. Introduction.....	5
3. EPC implementation.....	5
4. Recommendations and guidelines.....	5
a. Indicators for holistic and user-centric assessments.....	6
b. Energy Performance Certificates.....	7
5. Policy recommendations.....	8
References.....	10

Project duration: 1st September 2019 – 31st August 2022

Grant Agreement number: 839937 (Coordination and Support Action)

WP: 2 Deliverable: 2.5

Lead beneficiary: REHVA

Submission Date: 28th February 2023

Dissemination Level: Public

Due date: M24

U-CERT Website: www.u-certproject.eu

Revision History:

DATE	VERSION	AUTHOR/CONTRIBUTOR ¹⁾	REVISION BY ¹⁾	COMMENTS
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Acknowledgements:



U-CERT Consortium would like to acknowledge the financial support of the European Commission under the H2020 programme. This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement number 839937.

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1. Executive summary

The U-CERT project has aimed at **facilitating convergence of quality and reliability of national procedures**, leveraging the set of EPB Standards. During the project implementation, the project has mapped and characterised in detail the existing situation regarding EPB Assessments and Certification schemes in the 11 Member States [1]. Such analysis revealed that despite the mandate made by Directive 2018/844/EU [REF], the majority of Member States haven't produced or published their respective National Annexes. The reproduction of the mandate is reproduced next:

"Member States shall describe their national calculation methodology following the national annexes of the overarching standards, namely ISO 52000-1, 52003-1, 52010-1, 52016-1, and 52018-1, developed under mandate M/480 given to the European Committee for Standardisation (CEN)."

The lack of National Annexes poses, to the view of U-CERT's consortium, as one of the major obstacles hindering cross-country comparison of the EU's building stock energy efficiency. Furthermore, convergence in the level of ambition of national energy efficiency policies, level playing field for financing renovation projects at EU level, and free movement of professionals.

In response to the absence of available National Annexes, the project opted for a bottom-up approach. U-CERT leveraged REHVA's network to circulate a questionnaire among building professional experts across Europe [2]. The questionnaire aimed at identifying the national choices made regarding the overarching EPB Standard (i.e., EN ISO 52000-1). Indeed, the expertise from professionals working on energy efficiency projects in buildings could be leveraged to infer the national choices governing the energy performance assessments. This approach proved effective, and future initiatives may build on it to cover the complete set of EPB Standards.

Once the national status was characterised, U-CERT moved to crafting a proposal for a harmonised calculation methodology for EPB Assessments fully aligned with the complete set of EPB Standards [3]. Markedly 10 standards were carefully analysed, and more than 230 choices were made. U-CERT's ambition has been to lay the foundation for a common European methodology for EPB Assessments. In addition, the project has produced a set of holistic indicators covering complementary-to-energy dimensions, such as smartness, Indoor Environmental Quality (IEQ), and cost [4]. Furthermore, the project has integrated all this information into a template for next-generation Energy Performance Certificates (EPCs) [5] compliant with the latest developments in EU policy (i.e., the upcoming EPBD recast¹). As a Coordination and Support Action, the project has leveraged previous work from other research initiatives (e.g., ALDREN², Triple-A reno³, CEN-CE⁴, among others) and hopes to serve as basis for forthcoming Innovation Actions which may transfer the proposed methodology into a fully-fledged simulation software. Technical recommendations of how to bridge the gap between diverse national procedures and a harmonised European approach were outlined for the partner countries [6].

The U-CERT project has addressed one of the reasons hampering the **widespread acceptance and implementation of EPB Certification Schemes**, the low user-friendliness of EPCs. Leveraging ethnographic research techniques [7], the user perception regarding EPCs was obtained across the value chain stakeholders in 11 countries [8].

¹ More information at: https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficient-buildings/energy-performance-buildings-directive_en

² More on the project (754159) at: <https://aldren.eu/>

³ More on the project at: <https://www.rehva.eu/eu-projects/project/triplea-reno>

⁴ More on the Project (785018) at: <https://www.cen-ce.eu/>

Ultimately, U-CERT has strived to giving concrete **support to building professionals** regarding the promotion, use and adoption of holistic innovative technologies and indicators. Consequently, several supporting digital tools have been produced [9].

2. Introduction

This document is focused on providing recommendations to the national and regional EPBD implementing authorities in the Member States with regards to **improving the EPB Certification Schemes**. The U-CERT project has analysed more than 11 countries' EPCs in terms of content, indicators used, and visual design [1]. In addition, leveraging a multidisciplinary team of building professional experts (i.e., REHVA's network), the project has put forward a comprehensive set of holistic indicators covering complementary-to-energy dimensions, such as smartness, Indoor Environmental Quality (IEQ), and cost [4]. The technical proposal of new indicators has been carefully aligned with the outcomes from the ethnographic analysis on user perception regarding EPCs in the involved countries [8]. Furthermore, the project has produced a template for next-generation Energy Performance Certificates (EPCs) [5] compliant with the latest developments in EU policy (i.e., the upcoming EPBD recast). Therefore, the project counts on a proposal for a harmonised, holistic and user centred EPB Certification Scheme. Next, a series of recommendations aiming to bring the national EPC schemes closer to it will be put forward. The remainder of the document is structured as follows. Section 3 briefly outlines the current status regarding national EPC implementation. Section 4 provides recommendations and guidelines to improve the existing paradigm. Lastly, section 5 proposes some relevant policy recommendations.

For a detailed approach on how to support the uptake of EPB Standards into EPB Assessments and Certification Schemes, refer to [10].

3. EPC implementation

There is a wide variety of EPB Certification Schemes across Europe, both in terms of considered indicators and regarding the indicators used. As an illustration, see Figure 1.

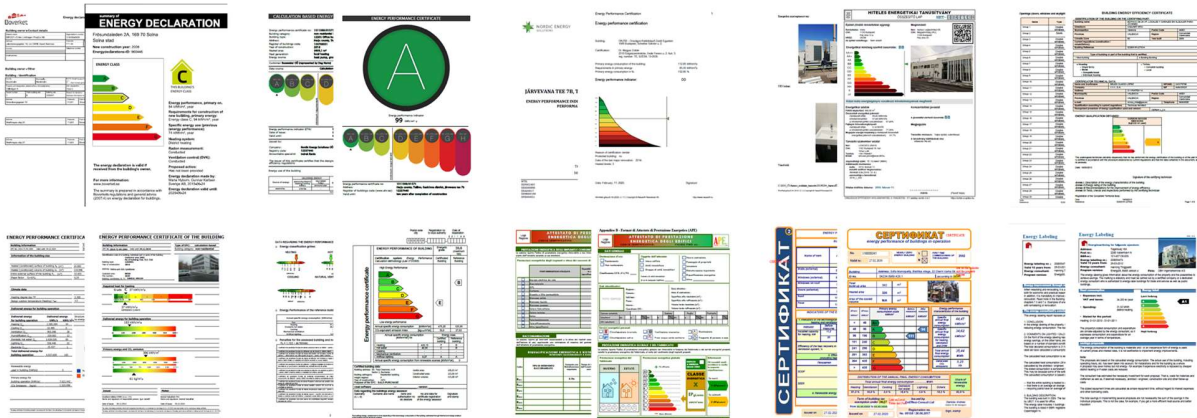


Figure 1. EPC implementation. Europe

There is relatively broad consensus on the coloured scale to grade the energy class. Although there is significant disparity on the main indicator used for the energy class, as well as for the rest of indicators, consideration of renovation measures, visual design of EPC, among others.

4. Recommendations and guidelines

The U-CERT project recognises the value and relevance of EPB Certification Schemes. The following recommendations intend to improve a key instrument in the promotion of the European building stock sustainability. Moreover, they have been drafted considering the upcoming EPBD recast, with a view to give concrete support to Member States when facing national implementation.

a. Indicators for holistic and user-centric assessments

The project analysed the building performance indicators present in voluntary and official EPB Certification Schemes [4]. Energy performance, although parametrised via diverse indicators (e.g., CO₂, primary energy consumption, delivered energy, etc.), was well-addressed. Nevertheless, the accurate definition of vast availability of indicators often requires qualifications and expertise that many EPC issuers lack. Furthermore, it has a significant impact on the cost-effectiveness of the practice. In addition, U-CERT advocated for the inclusion of more holistic indicators into EPCs, mainly IEQ, but also operational energy cost. IEQ indicators could be clustered into categories (i.e., EN 16798-1:2019), while maintaining individual meaning (e.g., room temperatures, air velocities, ventilation rates, CO₂ levels and building system noise levels, etc.). The assessment of IEQ in existing national EPB Certification Schemes was found to be scarce [1]. With a view to ease their introduction, the project posed for a different assessment in new and in existing buildings. The former ought to be based on design documentation and prospective calculations using dynamic simulations or hourly calculations, whereas the latter should leverage on-site measurements. U-CERT proposed an audit-like approach for the IEQ assessment in existing buildings [4] and leveraged the ALDREN TAIL Index estimating its applicability in more than 15 case study buildings in Europe. Ultimately, the project identified the synergies between existing EPCs and the Smart Readiness Indicator, advocating for a coordination between both assessments.

The user perspective – ranging from experts to laypeople – regarding EPCs outlined several positive and negative properties of current schemes [11]. The visual of the energy class through a colour-scale, pictures and diagrams was valued. Also, the possibility of comparison between pre- and post-renovation of a given building, showcasing a set of tailored renovation measures and the effect each of them may have in the building's energy performance. Accordingly, the suggestion of renovation measures to improve the building components and systems. The existing EPCs were reportedly long, complex, and difficult to understand by some users. The terminology and indicators used are complex and too technical for non-expert users in certain contexts. Parameters related to cost were generally not found. In addition, EPC were regarded static documents with virtually no capacity for relevant updates or monitoring functions and therefore decoupled from actual building performance and property management processes. EPCs were missing interactive functionalities. Among others, energy efficiency measures in EPCs were found to be poorly described, generalised, and undefined, hindering the user acceptance. Moreover, the user behaviour aspect was often found to be neglected.

Consequently, U-CERT puts forward a set of holistic indicators (i.e., energy performance, smart readiness, IEQ, and cost) to be used in EPB Assessments and Certification Schemes [12]. Depending on the application (e.g., energy performance certificate, building permit, permit to use, etc.) of EPB assessment, some indicators may be applicable or not. Moreover, they may rely on calculations or measurements. Therefore, a single pool of indicators is proposed, enabling flexibility regarding the use by Member States, on account of the application and building situation (i.e., measured indicators are only available in existing buildings). U-CERT outlined the degree of alignment with this pool of indicators for each national EPB Certification scheme considered in the project [13]. Nevertheless, all analysed Member States' EPB Certification Schemes were significantly apart from U-CERT's proposal in terms of indicators. The Hungarian and Italian EPCs were the ones closest to U-CERT's pool of indicators, and only included a 36% of them. U-CERT estimates that Member States trying to adapt their EPB Certification Schemes and EPC visual design would benefit from technical guidance on how to modify their existing procedures in a cost-effective manner.

Among the main recommendation regarding energy performance indicators is the use of the overall non-renewable primary energy use, calculated according to H5 in ISO 52000-1's Annex H, as the main EP indicator. A key recommendation proposed by the U-CERT project is the replacement of total primary energy use by non-renewable primary energy use which is a fundamental issue for the proper calculation of building performance, including that of zero-emission buildings (ZEBs).

The total primary energy indicator does not allow for a meaningful calculation of the energy use, as it does not distinguish between the renewable and non-renewable energy, and it includes heat extracted from ambient. For example, when comparing the energy performance of gas boilers with heat pumps, the gas boilers have a lower total primary energy use due to this inclusion. U-CERT project proposes to use non-renewable primary energy as an indicator instead and update the maximum thresholds (Annex III of the EPBD Recast as proposed by the European Commission) accordingly, so that when there is a very low amount of non-renewable energy required in ZEBs, the CO₂ is compensated by renewable energy generated on-site, from a renewable energy community (described in Directive (EU) 2018/2001), district heating and cooling systems, or from the grid. Thus, making the calculation of ZEBs more transparent, while removing the over-penalisation of certain technologies, most notably in this example heat pumps.

U-CERT advocates to integrate IEQ indicators into EPB Certification Schemes, for which EN 16798-1's categories ought to be leveraged. Moreover, parameters explicitly representing the interdependency of energy performance and indoor comfort are recommended (i.e., summer and winter thermal indoor comfort). ALDREN TAIL is recognised as a best practice and should be explored for detailed applications in both new and existing buildings.

The project also advocates to coordinate the building smartness and energy performance assessments. Accordingly, the EPC indicators covering physical and technological elements ought to be leveraged for a seamless integration of the SRI into EPCs. U-CERT has carefully analysed the overlap of the proposed user-centred, holistic, and harmonised EPC indicators with the SRI's method A and B version 3 [12].

b. Energy Performance Certificates

EPCs constitute the main document for the communication of the energy performance in buildings to final users. Responding to the user's perceptions on EPB Certification Schemes, U-CERT proposes a dual design for the EPC report visual design depending on the user type. An extensive and very technical EPC report for expert users (i.e., designers, architects, engineers, inspectors, auditors, etc.), and a reduced one for non-expert users (i.e., building owners and tenants).

The basic information should be made accessible to non-expert users, while explicitly labelling the more complex information as only relevant to expert users. Thus, building users will not be discouraged by not understanding some of the parameters and indicators that very often are included in most EPCs. The underlying philosophy is to avoid using complex terminology (e.g., non-renewable primary energy, thermal transmittance, coefficient of performance, etc.) and very technical units (e.g., kWh/m², W/m²·K, etc.) that fail to communicate the pursued objective, which is to boost energy efficiency in buildings.

The proposed design for EPC report [12] is recommended to be used as a base for the national implementation of the latest provisions regarding EPC template on the EPBD. Furthermore, U-CERT advocates for a digitised app-like EPC with interactive features, and data management functionalities.

Regarding the EPC rating, U-CERT's choice is the method given in EN ISO 52003-1 [REF], with the single reference point. The scale ranges from class A to G, in line with the upcoming EPBD recast provisions. The boundaries of the classes are based on a nonlinear scale ($y = \sqrt{2}^{(n-n_{ref})}$), with the reference energy performance placed between two classes. The value of n_{ref} places the reference energy performance on the scale and is subject to national or regional choice, as per the EPB Standards, as it is the definition of the reference energy performance indicator.

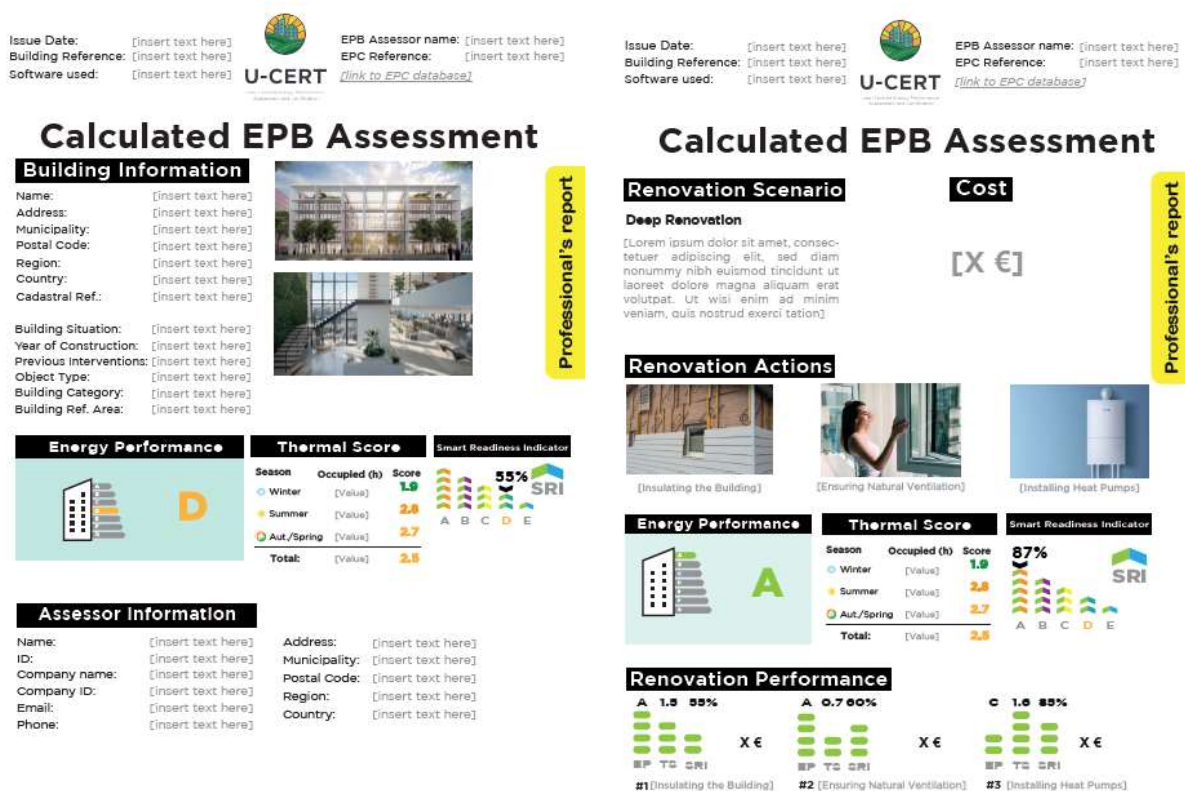


Figure 2. U-CERT's EPC design. Extract from [12].

However, as EPC-s are planned to be used in national renovation progress monitoring in ongoing EPBD revision, including the harmonisation of EPC scales, the EPC class bandwidth deserves further guidance to provide conditions for harmonised national implementation.

Regardless of the assessment type (i.e., calculated or measured), U-CERT advocates to include renovation recommendations in EPC reports of existing buildings.

5. Policy recommendations

U-CERT has aimed at **facilitating widespread acceptance and implementation of EPB Certification Schemes**. At the beginning of the project, the Renovation Wave strategy was published, stressing the relevance of EPB Assessments and Certification Schemes as valuable tools to promote deep renovation. The end of the project implementation has coincided with the process for the EPBD recast, which is strongly focused in enhancing the quality of the procedures for assessing the buildings' energy performance. U-CERT's value proposition in terms of EPB Assessment indicators and Certification Scheme design ought to serve Member States to a successful EPBD implementation.

The proposed new EPBD states the importance of indoor environmental quality (IEQ), also during the summer period. U-CERT includes within the overall EP indicators the winter thermal comfort and summer thermal comfort indicators. Moreover, it includes the ALDREN Thermal Score [14] as core evaluation parameter of the building's IEQ. U-CERT has also promoted the field testing of ALDREN TAIL index and has included it - as voluntary indicator - in U-CERT's EPC.

The Smart Readiness Indicator (SRI) is reinforced by the EPBD proposal. U-CERT has participated in the testing phases of the technical support group, and has decided to include

the SRI, as developed in the final report, into U-CERT's EPC proposition. Furthermore, U-CERT has outlined a cost-effective way of integrating the SRI assessment into EPB Assessments, reducing the workload for EPB assessors. This approach is consistent with the spirit of the revised EPBD of combining inspections and certifications as far as possible.

The revised EPBD of combining inspections and certifications as far as possible. The revised EPBD uses the concept of staged renovation, in relation to voluntary building renovation passports. U-CERT's EPC proposes including renovation scenarios, composed by more elemental renovation actions, with a view to triggering deep renovations, even if they should occur step-by-step.

The proposal states the need to digitalise EPCs and integrate them into databases facilitating data exchange and administrative procedures. In that regard, U-CERT's EPC is conceived as a repository of holistic indicators and information. Although the proposed EPC report is presented as a static document in the deliverable [12], the itemization of the U-CERT EPCs' content aims to lay the foundation for a further integration of EPCs into databases and digital building logbooks. Moreover, some interactive features within the proposed U-CERT's EPC are included, which will only increase in future initiatives that further digitise EPCs.

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OUR TEAM



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