Smart living EPC

D7.3 Policy Recommendations

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D7.3 Policy Recommendations

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Executive Summary

This document describes the process of identifying, analysing and prioritising recommendations, primarily related to standardisation to support the market uptake of SmartLivingEPC solutions, as well as policy recommendations, as standardisation and policy are closely linked, i.e. standards and standardization as strategic instruments embedded in the policy environment.

The standardisation landscape identified European and International standards relevant for SmartLivingEPC. It supports the project in ensuring that its activities and solutions comply with standards, particularly those that serve as a means of demonstrating presumption of conformity with regulations. This strengthens the acceptance and confidence of the market, including public authorities, in SmartLivingEPC solutions.

Findings from the application of the standards in the project were evaluated, as were gaps in the standardisation landscape that were deemed important for the successful deployment of SmartLivingEPC solutions. The most important gap was identified in area of training and competences of assessors working with different assessment instruments like EPC, SRI (Smart Readiness Indicator), or BRP (Building Renovation Passport). The need for the revision of existing standards and the development of new standards was formulated as recommendations communicated to the relevant standardization communities.

This deliverable is written by ASI with the collaboration of FRC, REHVA, UDEUSTO, GOI, ANEC and EUNICE.

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List of Acronyms and Abbreviations

Term	Description
BEMS	Building Energy Management Systems
BRP	Building Renovation Passport
CEN	European Committee for Standardization
CENELEC	European Committee for Electrotechnical Standardization
EED	Energy Efficiency Directive
EEMS	Electrical Energy Management Systems
EN	European Standard
EPBD	Energy Performance of Buildings Directive
EPC	Energy Performance Certificate
IEC	International Electrotechnical Commission International Standard issued by the International Electrotechnical Commission
ISO	International Organization for Standardization International Standard issued by the International Organization for Standardization
SRI	Smart Readiness Indicator
TC	Technical Committee

1 Introduction

This deliverable was developed under task 7.4, *SmartLivingEPC recommendations: policy, standardization and best practices*, which is part of SmartLivingEPC work package 7, *Communication, Dissemination & Exploitation*. Beginning in M7 of the project, task 7.4 focused on the following:

- Identification of relevant European and international standards (both existing and in development);
- conduction of a gap analysis determining any inconsistencies or areas for improvement in existing standards or options for new fields in standardization;
- communicating the insights from the gap analysis to standardization bodies, as a revision of existing standards or as a proposal for new ones.

The result of these activities are recommendations for policy measures and standardization, which are presented in this deliverable.

1.1 Scope and objectives of the deliverable

This deliverable deals with the identification and analysis of gaps in the standardization landscape in the scope of SmartLivingEPC, i.e. gaps between standards and needs of the project either in terms of degree of useability of relevant standards applied by the individual tasks of the project or even lack of standardization at all.

Based on the gap analysis this deliverable includes recommendations for future standardization activities, i.e. revision of existing standards as well as proposals for elaborating new standards, and as well as recommendation for policy measures.

1.2 Structure of the deliverable

This deliverable is structured as follows on the basis of a methodological approach:

Section 2 details how the standardization landscape relevant for the scope of SmartLivingEPC was drafted. It is based on desktop research and was then further qualified for gathering deeper insights regarding potential standardization gaps and the degree of useability of standards applicable for the project.

Section 3 is about the methodology and conduct of a gap analysis to identify gaps in the standardization landscape in both terms, the need to revise existing standard and the need to propose new standardization activities to contribute to the market uptake of SmartLivingEPC solutions.

Section 4 contains the standardization recommendations addressing policy, general ones as well as targeting specific standards and the proposal for a new activity related to training and competence based on Section 3.

Section 5 concludes the deliverable.

1.3 Relation to Other Tasks and Deliverables

Inputs received by this deliverable are from the whole SmartLivingEPC consortium. In particular – and as outlined in specific paragraphs – recommendations to standardization and policy are based on

- Deliverable 2.4, Asset methodology assessment in building level v2
- Deliverable 2.7, Asset rating calculation methodology of SmartLivingEPC v3
- Deliverable 3.4, Operational assessment methodology in building level v2
- D6.1, SmartLivingEPC Manual for implementation v1 and Task 6.1 SmartLivingEPC training and guidance for implementation

- Task 7.6 Liaising with sister projects and other initiatives as a part of NextGenEPC cluster activity

2 Standardization landscape

2.1 Desktop research

An initial literature search was carried out by Austrian Standards International (ASI). This exercise identified the most important subject areas, which were further classified according to their area of application, which falls within the scope of SmartLivingEPC. Search criteria included energy efficiency, energy performance, IoT, Building information modelling (BIM).

The literature search relied on a combination of resources, derived from standards databases of the European Committee for Standardization (CEN), European Committee for Electrotechnical Standardization (CENELEC), International Organization for Standardization (ISO), International Electrotechnical Commission (IEC), as well as contributions from the consortium partners.

The information gathered was made accessible to all project partners. The hereby developed standardization landscape includes identified 211 published standards and standards under development and provides additional information, e.g. each document's scope and the responsible standardization body. The identified standards are from the following Technical Committees, whereby ten of them are from the European Committee for Standardization CEN, 18 from the International Organization for Standardization ISO and one from the national Standardization Body of the Netherlands:

- CEN/CLC/JTC 14, Energy management and energy efficiency in the framework of energy transition
- CEN/TC 156, Ventilation for Buildings
- CEN/TC 169, Light and lighting
- CEN/TC 216, Chemical disinfectants and antiseptics
- CEN/TC 228, Heating systems and water-based cooling systems in buildings
- CEN/TC 247, Building Automation, Controls and Building Management
- CEN/TC 350, Sustainability of construction works
- CEN/TC 371, Energy Performance of Buildings
- CEN/TC 442, Building information modelling (BIM)
- CEN/TC 89, Thermal performance of buildings and building components
- ISO/IEC JTC 1/SC 41, Internet of things and digital twin
- ISO/TC 159, Ergonomics
- ISO/TC 159/SC 5, Ergonomics of the physical environment
- ISO/TC 163, Thermal performance and energy use in the built environment
- ISO/TC 163/SC 1, Test and measurement methods
- ISO/TC 163/SC 2, Calculation methods
- ISO/TC 184/SC 4, Industrial data
- ISO/TC 184/SC 5, Interoperability, integration, and architectures for enterprise systems and automation applications
- ISO/TC 205, Building environment design
- ISO/TC 207/SC 5, Life cycle assessment
- ISO/TC 211, Geographic information/Geomatics
- ISO/TC 22/SC 31, Data communication
- ISO/TC 268, Sustainable cities and communities
- ISO/TC 274, Light and lighting
- ISO/TC 59/SC 13, Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM)
- ISO/TC 59/SC 14, Design life
- ISO/TC 59/SC 17, Sustainability in buildings and civil engineering works
- ISO/TC 86/SC 6, Testing and rating of air-conditioners and heat pumps

- Normcommissie 351264 'Conditiemeting' (standardization committee of NEN, Nederlands Normalisatie-instituut)

Throughout the duration of the project, further standardization activities were monitored by ASI and new ones were communicated to SmartLivingEPC such as

- CEN-CENELEC Workshop Agreement “Standardized On-site Smart Readiness Indicator (SRI) Building Audits” or
- CEN Workshop Agreement “EUB SuperHub - A harmonization of KPIs for supporting the next generation of EPCs”.

2.2 Qualification of the standardization landscape

In order to qualify the initially drafted standardization landscape for gathering first insights regarding potential standardization gaps a standardization questionnaire was drafted.

The questionnaire of the online survey was developed in the following two stages:

- **Pre-Launch** (design phase): The main objective of this phase was to find out the target audience's opinion on the questionnaire. Through this preliminary stage, it was possible to guarantee the proper functioning of the digital tool, as well as to improve the formulation and structure of the survey. The questionnaire has been designed as an online survey, accessible remotely facilitating subsequent data processing, and addressing the diversity of the SmartLivingEPC project solution(s). Regarding the extent of the questionnaire, it was concluded by the partners that a too extensive questionnaire poses the risk of not being completed at all and thus not achieve a desired and useful result. The contributions received from the partners were implemented for the finalization of the questionnaire.
- **Launch**: The final questionnaire serves the purpose of gathering detailed information on the potential gaps identified by the consortium members. The online survey was circulated to all SmartLivingEPC partners in November 2023. The deadline for completing the questionnaire was set eight weeks after date of circulation, i.e. 14th January 2024.

The standardization questionnaire contained the eleven questions. A total of eleven responses were received to the questionnaire. The responses were reviewed by Task 7.4 in its meeting on 17. January 2024:

Q1. Do you apply standards topically relevant to the SmartLivingEPC project? (for example *ISO 52000-1:2017, Energy performance of buildings - Overarching EPB assessment - Part 1: General framework and procedures*)

Responses: 6 (six) responded that they apply standards topically relevant to the SmartLivingEPC project. 5 (five) responded that they don’t apply standards topically relevant to the SmartLivingEPC project.

Q2. Which standards relevant to the SmartLivingEPC project do you use?

Responses: All standards mentioned by the questionnaire respondents were already included in the initial list.

Q3. From your perspective: Are any of your before mentioned standards difficult to apply or are there any barriers to their implementation?

Responses: 50 % of the respondents said, that some of the mentioned standards are difficult to apply, while the other 50 % said, that all mentioned standards are easy to apply.

Q4. Please indicate all standards that are difficult to apply and also specify the difficulties or barriers for their individual application.

Responses: One response was, that level(s) standard is not difficult to apply, nevertheless is not adopted in all the construction stages.

Another example was EN 15316-4-2, *Energy performance of buildings - Method for calculation of system energy requirements and system efficiencies - Part 4-2: Space heating generation systems, heat pump systems, Module M3-8-2, M8-8-2*. The respondent clarified that in this standard for heat pumps there is lack of clarity and data (table missing). There are too few explanations about the physical phenomenon. It was observed that the presentation in the standard doesn't follow the calculation procedure, topics are mixed and there are a lot of equations with errors.

Q5. Are you aware of any standards relevant to the project without applying them yourself?

Responses: 73 % of the respondents are not aware of any standards relevant to the project without applying them by themselves.

Q6. Which further standards are you aware of without applying them yourself?

Responses: Those 27 % of the respondents that are aware of standards relevant to the project without applying them by themselves, provided the following:

The whole ISO 52000 series, e.g. ISO 52000-1:2017; ISO 52003-1; ISO 52010-1; ISO 52016-1 and ISO 52018-1 as well as ISO 19650.

One respondent has been following activities of CEN TC 350, Sustainability of construction works, and especially gave assessment of:

EN 15804:2012+A2:2019/AC:2021, Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products

EN 17672:2022, Sustainability of construction works - Environmental product declarations - Horizontal rules for business-to-consumer communication

ANEC has raised concerns about these standards and is not supportive of them, as explained in ANEC Commentary: 'Sustainability in the construction sector. A consumer perspective on relevant standards and initiatives' (ANEC-SUST-2021-G-046).

They are also involved in several standardization processes linked to Ecodesign/ Energy efficiency of household products (see final question on standardization processes).

Q7. In your view, which main areas of knowledge relevant to the SmartLivingEPC project are already mostly covered by standards?

Responses: based on the feedback from respondents the main areas of knowledge relevant to SmartLivingEPC already mostly covered by standards are illustrated in Figure 1.

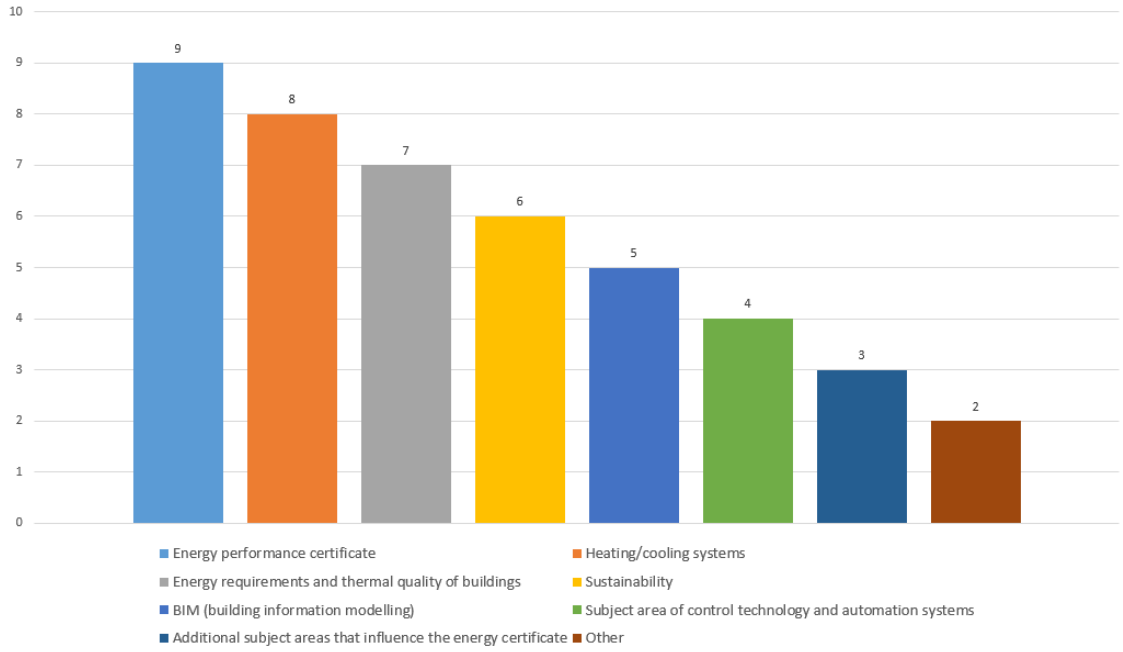

Figure 1. Main areas of knowledge relevant to the SmartLivingEPC project that are already mostly covered by standards

Other areas are lighting and areas with emerging new needs for standardization due to the revision of the EPBD and the outcomes of SmartLivingEPC.

Q8. In your view, which main areas of knowledge relevant to the SmartLivingEPC project are not covered by standardization yet?

Responses: Based on the feedback from respondents the main areas of knowledge relevant to SmartLivingEPC not covered by standardization yet are illustrated in Figure 2:

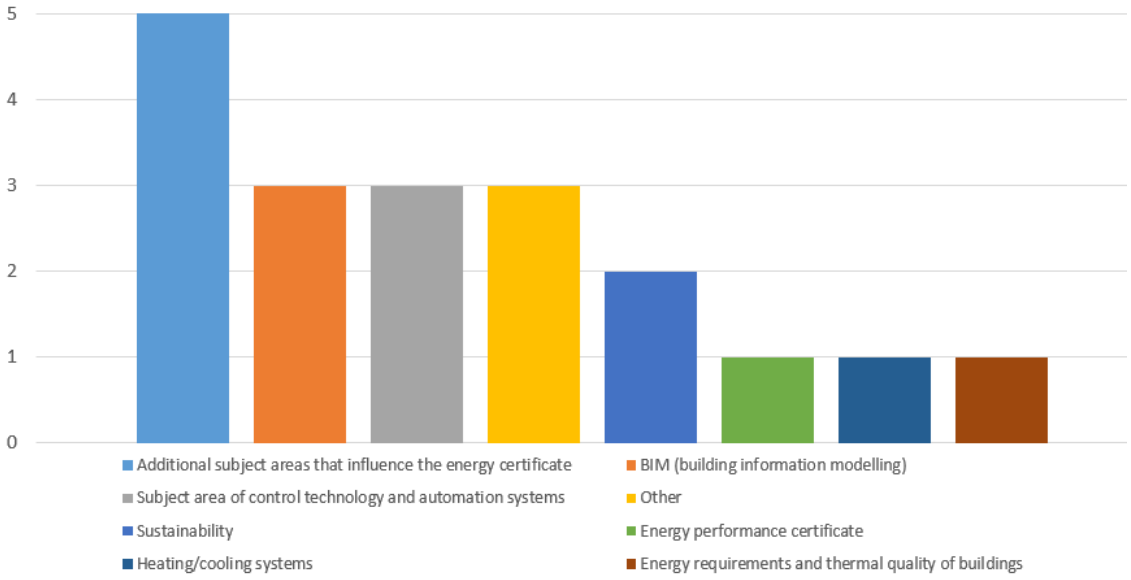

Figure 2. Main areas of knowledge relevant to SmartLivingEPC not covered by standardization yet

„Other“ not yet covered areas are:

- energy & non energy consumption of communities, communities' sustainability
- Digital Twins
- It is essential to improve accuracy and reduce the gap between assessment of the EPC and actual performance. Current EPCs might be very far from the real energy performance of buildings.

  Feedback received from French consumer organizations highlight shortcomings linked to:

  1 – Training and qualifications of diagnosis contractors lacking

  2 – The criteria to establish a diagnosis vary from one contractor to another: the official indicators and instructions are not detailed enough and are very hermetic.

  3 – Contractors not considering what they cannot verify by themselves: for instance, if there is insulation between frame and roof but cannot be verified unless they break everything, they indicate «No insulation of the roof» on the EPC.

  4 – Contractors not considering many energy-saving architectural choices or layouts of the room, for instance:

  a. The orientation of the building, nor the ratio glass openings/south orientation.

  b. The position of the chimney pipes, even where they are purposely placed at the center of the house, in order to lose less energy possible by diffusing the heat throughout the house.

  c. The air intake of the chimney where it is purposely placed in the garage or any other secondary room separated from the main one (where people do live), precisely to imitate convection currents in the main local.

  d. The architectural choices to place the main rooms of the house south oriented and the secondary ones north oriented, in order to avoid cold main-room walls.

  e. The energy consumption measured in energy invoices of the housing.

  In such a house, one can have small radiators; if the criteria provide that, say, in all 15 sq meter room, the power of the radiators must be 1000W, but the actual one is 500W (and sufficient), the energy efficiency of the said room will be underestimated, thus underrated.

  It is crucial to properly measure the energy loss, considering notions of thermal comfort, for instance, when comfortable, one does not turn up the heating.

  EPCs tend to focus on electrical heating and rate it very low as a principle, instead of making a fine analysis of the real facts and characteristics of the housing.

Q9. In your view, is there a substantial need for a new standard related to the focus of SmartLivingEPC? If there is, please specify.

Responses: Respondents expressed a substantial need for a new standard related to the focus of SmartLivingEPC in the following areas:

- Operational rating of energy performance of buildings

- Measured energy, energy and non-energy for communities
- Beyond the one on Operational Energy Performance Assessment, standards dealing with the technical domains of the SRI assessment from the building and district perspective
- Operational calculations; neighborhood assessment indicators; weighting methodology
- Assessment of the buildings in the complex or district level
- Standardized way of providing benchmarking and retrofitting recommendations on a building or district level

Q10. Are you already involved in standardization processes? If so, please let us know which working groups or committees you are involved in.

Responses: Respondents participate in the following standardization committees:

- CEN/TC 371, Energy performance of buildings
- CEN TC 371/WG5, Energy Performance of Buildings - Operational Rating
- CEN/TC 442, Building Information Modelling (BIM)
- CEN/CLC/JTC 14, Energy management and energy efficiency in the framework of energy transition
- ISO/TC 59/SC 13, Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM)
- ISO/TC 163, Thermal performance and energy use in the built environment

ANEC added, that they are also involved in reaLIFEstandards[1], a project co-funded by the European Union's LIFE program with the aim to promote the role of environmental and consumer interests in many of the standards that underpin Europe's clean energy transition – including those focusing on household products like heat pumps, televisions, electronic displays, or washing machines.

Q11. Would you like to add any additional comment?

Responses: no

The responses to the standardization questionnaire were considered in an adjusted list of the standards identified before.

In order to exploit potential synergies with CEN/TC 371/WG5, the alignment of task activities with those of WG5 were addressed at each T7.4 meeting. In addition, detailed information about the possibility to initiate an official liaison between CEN/TC 371/WG 5 and SmartLivingEPC was provided and discussed within T7.4 as well as during consortium meetings.

Additionally, a standardization webinar was organized by Austrian Standards for the whole SmartLivingEPC consortium to ensure, that everybody is familiar with standardization and has the same level of information on standardization processes, standardization bodies and how to get involved in standardization. The webinar was on 11. September 2024 with 15 participants. The presentation and recording were made available on the SmartLivingEPC's SharePoint.

The topics addressed in the webinar were:

- Why standardization matters for research and innovation

[1] reaLIFEstandards: https://ecostandard.org/realifestandards/

- Standardization processes of CEN, CENELEC, ISO and IEC in a nutshell
- How to influence/contribute to standards currently under development
- What is necessary to initiate the elaboration of a new standard or the revision of an existing standard
- Standards and IPR

The webinar closed with a “Mind the gap” detailing the next standardization activities in SmartLivingEPC.

With the qualified standardization landscape task 7.4 proceeded to the gap analysis.

3 Gap analysis

3.1 Methodology

The process for carrying out the gap analysis is characterized by a continuous and multidirectional exchange of information and opinions between the participants in task 7.4 and the whole SmartLivingEPC consortium.

The methodology follows the following steps:

- **Step 1**. Identification of the degree of useability of standards applicable for the project, including the lack of standardization (see Sub-Section 2.2);
- **Step 2**. Interactive standardization workshops (see Sub-Section 3.2) to validate and narrow down the findings from the step 1;
- **Step 3**. Preparation of findings from the survey (step 1) and the workshops (step 2) for the gap analysis (see Sub-Section 3.3); the output from step 3 is the input for the gap analysis;
- **Step 4**. Completing the gap analysis (see Sub-Section 3.4).

Since the gap analysis identified both, needs to revise existing standards and to propose new standards as well as policy issues, the result of the gap analysis led to recommendations (Section 4), which also addresses standardization and policy issues.

3.2 Standardization workshop

Austrian Standards as lead of task 7.4 organized the SmartLivingEPC Standardization workshop, which was held online on 30. September 2024. The whole SmartLivingEPC consortium was invited to this workshop. The goal of this workshop was to identify, evaluate and prioritize standardization gaps, such as deficiencies or barriers in existing standards or the substantial need for new standards in a particular field. It was also explored how SmartLivingEPC can support closing these gaps. 13 attendees participated in this workshop.

The workshop was conducted interactively via MS Teams and the online-collaboration platform Miro. For easier readability, the contents and results have partially been converted into plain text in the present deliverable.

At the beginning of the workshop, a brief overview of the workshop objectives, as well as earlier standardization related project results were provided. After the participants entered their names and expectations to the Miro board, the workshop could delve deeper into the technical subject matter and related gaps in standardization.

In the workshop the results from the standardization questionnaire (see Sub-Section 2.2) were again evaluated and confirmed.

Next to the results from the standardization questionnaire further ideas for standardization were expressed by the workshop participants – linking them to SmartLivingEPC Work Packages and tasks. Figure 3 is a screenshot from Miro and shows all the ideas.

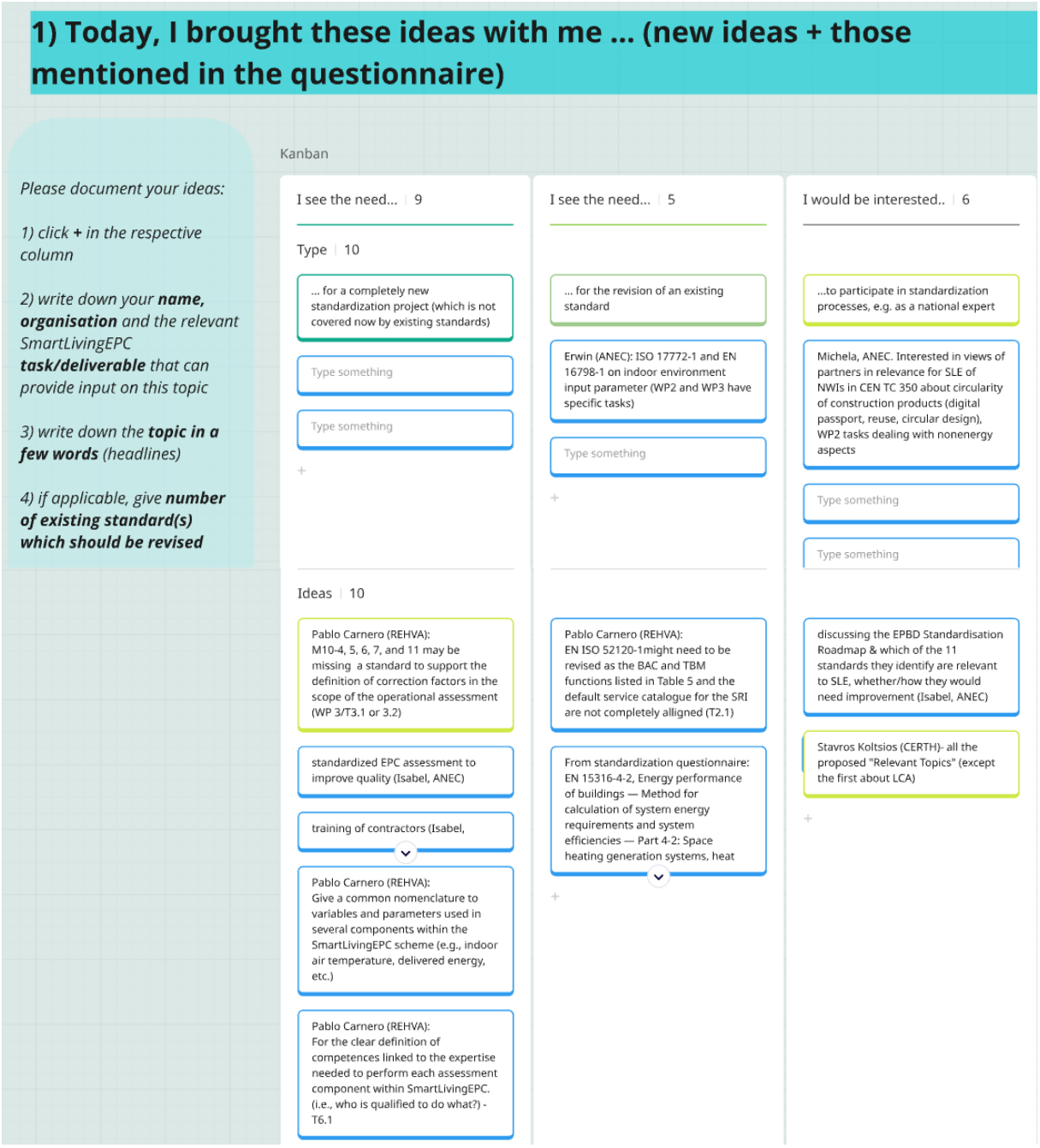

Figure 3. Kanban board of further standardization ideas

These ideas and the results from the standardization questionnaire were then prioritized by the participants in terms of the need for new standardization. The participants were asked to vote for the standardization ideas which were most important to them. Each participant could provide up to three votes by placing one avatar each next to the idea in the matrix. Figure 4 shows the result.

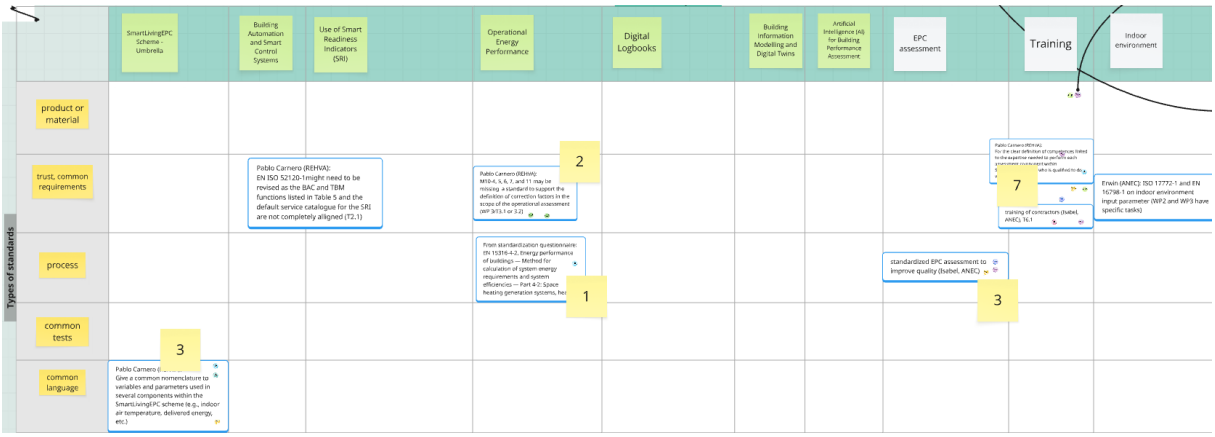

Figure 4. Ranking of the standardization ideas

As shown in Figure 4 the highest ratings have received:

- **Training**: Need for a standard defining competences linked to the expertise needed to perform each assessment component within SmartLivingEPC (i.e., who is qualified to do what, task 6.1) and the training of contractors (task 6.1).
- **Terminology**: Need for a standard with terms and definitions for variables and parameters used in several components within the SmartLivingEPC scheme (e.g., indoor air temperature, delivered energy, etc.).
- Standardized EPC assessment to improve quality.

As "training of contractors and clear definition of responsibilities" was rated highest by far (7, while the next highest idea was rated 3), it was agreed to set up a small group to elaborate this idea further.

In addition to the low rating, the reason why the topic of "Terminology" was not pursued further is that it was essentially a matter of standardizing the terminology used in SmartLivingEPC.

3.3 Small group for the most relevant gap

Nine participants from SmartLivingEPC joined the small group to work on the idea for a standard on Training of contractors and clear definition of competence. For better readability, the results of this section of the Miro board are presented in Table 1.

Table 1. Results of the collaboration action "Training of contractors and clear definition of competences"

Standardization idea:	**Training of contractors and clear definition of competences**
Which activity (work package, deliverable, solution) forms the basis for this proposal?	T6.1 SmartLivingEPC training and guidance for implementation
Which challenges should be tackled by developing a new standard or revised standard?	• Clear understanding of the different instruments (EPC, SRI, BRP, ...) and what can be expected from these • criteria to establish a diagnosis vary from one contractor to another

Standardization idea:	Training of contractors and clear definition of competences
What are the future benefits of the standard?	• common language • clear understanding of the different instruments resp. diagnosis • common understanding of what criteria should be considered by contractors • knowing who is responsible for what
Legal environment **Directives and relevant European legislation**	• EPBD (EPC, SRI, BRP) • EPBD Article 25, Independent experts • EPBD Article 26, Certification of building professionals • EPBD Article 29, Information • EED Art 28
Scope: What is the standard about? (requirements, framework, etc.)	1 or more standards needed? TBD
Scope: Who is the target group of this standard?	would EPB assessors be required to also assess SRI or other tools?
What is needed? **What is missing in current practices or standards?**	• Need for clear definition of competences linked to perform each assessment component (i.e. who is qualified to do what?) • knowing who is responsible for what • consistent criteria to establish a diagnosis from one contractor to another • Need for standardized training of contractors • common understanding of what criteria should be considered by contractors • clear understanding of different instruments (EPC, SRI, BRP, ...) and what can be expected from these • Knowing whether EPB assessors would be required to also assess SRI or other tools
What solution can SmartLivingEPC provide for contractors training? **Where and how can project results close an existing need?** **Which project results seem directly applicable to addressing the needs?**	Option to define list of contents for a training course for contractors? Example: "Training for contractors should focus on the following methodologies used for assessing energy performance and indoor environmental quality....." T6.1 SmartLivingEPC training and guidance for implementation // D6.1 SmartLivingEPC Manual for implementation v1
Is there something we can recommend without having respective project results/deliverables?	Option to define list of contents for a training course for contractors? Bloom's taxonomy of competences [1]

It was observed by the group that there are big differences in member states and in order to harmonize the individual approaches a recommendation to policy makers might be useful, in particular a standardization request of the European Commission to CEN focusing on the competences. This would increase the level of

transparency with clear definition of competences linked to perform each assessment component (i.e. who is qualified to do what).

The group recommended to further develop the CEN-CE Project results to obtain general training guidelines, e.g. revise the list for standards to provide training on[2]. As target groups for the training assessors and anyone applying SmartLivingEPC Scheme were identified.

Attention was given to CEN/TC 247/WG 7, *Building Automation, Controls and Building Management - Building Management*, with a proposed work item on *Smart readiness indicator (SRI) assessor competencies*. The purpose of this proposed CEN Technical Report is to provide competences for individuals aiming to execute SRI assessments.

3.4 Completing the gap analysis

Based on the results from standardization workshops (Sub-Section 3.2 and Sub-Section 3.3) as well as the accordingly updated qualified standardization landscape (Sub-Section 2.2) the standardization recommendations were prepared as part of completing the gap analysis.

Task 7.4 in its meeting on 21. January 2025 took in this process the latest findings into account from

- the Roadmap for the set of EPB standards with regard to the key global challenges, prepared by ISO/TC 205 & 163 Joint Advisory Group on coordination of the ISO 52000 family EPB standards and CEN/TC 371 Task Group on Systematic Review/Standardization Request & EPBD4 [2]
- the ISO/TC 163 and ISO/TC 205 Open Workshop, Standardization leading to harmonization for decarbonization in the built environment, held on 30 September 2024 with the main purpose to bring attention to, and discuss, the opportunities in developing and using ISO standards to meet the global needs of decarbonization and energy efficiency in the built environment.

Regarding the Roadmap for the set of EPB standards it was noted that it highlights 11 examples of EPB standards which are likely to require significant technical upgrades as a matter of priority. All standards highlighted in the roadmap were either requested by SmartLivingEPC partners for their work in the project or mentioned as relevant in the standardization questionnaire and used in D6.1.

The draft of the standardization recommendations was circulated first to all task 7.4 partners and then to the whole SmartLivingEPC consortium for final feedback (duration from 7. April till 30. April 2025). Editorial feedback was received and included. The result is in Section 4.

4 Policy and Standardization recommendations

4.1 Policy Recommendations

A first set of Policy Recommendations was issued in November 2023 and can be downloaded from the SmartLivingEPC website[3]. It was prepared in the scope of SmartLivingEPC and they are the outcomes of the project's research on how to improve the existing EPC schemes. They were developed to support the revision of the Energy Performance of Buildings Directive under the lead of ANEC in cooperation with task 7.6 as a NextGenEPC cluster activity:

PR#1: Integrated Lifecycle Energy Assessment: Advancing Holistic Building Evaluations through IoT and AI.

[2] https://www.cen-ce.eu/epb-standards-covered.html

[3] https://www.smartlivingepc.eu/en/Project%20Results%20%20Documents/Promotional%20material/SLE%20Policy%20Reccomendations_nov2023.pdf

Recommend the adoption of an integrated energy performance assessment methodology that considers the building's entire lifecycle data. This should leverage IoT and AI tools to evaluate a building's holistic energy performance, encompassing elements such as air quality, comfort, and well-being of occupants.

PR#2: Empowering EPC with SRI: A Blueprint for Enhanced Energy Savings

Endorse the integration of the Smart Readiness Indicator (SRI) scheme into the Energy Performance Certificate (EPC) calculation procedure. The SRI, being a measure of building intelligence, should influence the final EPC rating to promote energy savings in the building sector.

PR#3: Sustainability Meets Energy: Incorporating Level(s) Indicators into Future Energy Performance Certificates.

Advise integrating sustainability indicators from the Level(s) scheme into future EPCs. This will harmonize building energy performance considerations with European Union sustainability initiatives and support a life cycle approach to building evaluation.

PR#4: Revolutionizing EPCs: Merging Periodic Building Technical Systems Audits for Accurate Energy Classification.

Encourage the incorporation of building systems' periodic audit results into the EPC calculation process. This ensures that the operational energy efficiency of building technical systems is actively considered when certifying a building's energy performance.

PR#5: Digital Construction in EPCs: Leveraging Industry 4.0 Tools for Precision-Certification.

Advocate for the inclusion of digital construction practices from Industry 4.0 in the certification process. EPCs should be compatible with tools like Building Information Modelling (BIM) and be informed by real-time data from smart sensors and digital twins.

PR#6: EPCs and Digital Logbooks: Enhancing Building Transparency through Integrated Frameworks.

Propose that future EPCs are designed to be compatible with digital building logbooks. This will enhance transparency and decision-making by consolidating building lifecycle information and integrating it with established frameworks.

PR#7: Neighborhood-Scale Energy Classification: Pioneering District-Wide Efficiency Assessments.

Support the establishment of a neighborhood-scale energy classification methodology. Such a scheme should evaluate individual building units in context with their wider energy community, promoting district-level energy efficiencies.

PR#8: Advancing Operational Rating: Establishing Robust Methodologies and Practices for Comprehensive Building Evaluations.

Operational ratings offer an authentic evaluation of a building's energy usage and environmental impact. Key recommendations include developing standardized operational rating assessment methodologies, integrating real-time data, and promoting interdisciplinary collaboration for refining rating practices.

As part of the gap analysis and according to EPB standardization roadmap the following standards were identified as of high relevance:

- EN 15316-4-2:2017, Energy performance of buildings - Method for calculation of system energy requirements and system efficiencies - Part 4-2: Space heating generation systems, heat pump systems, Module M3-8-2, M8-8-2
- EN 16798-1:2019, Energy performance of buildings - Ventilation for buildings - Part 1: Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal environment, lighting and acoustics - Module M1-6
- EN 16798-5-1:2017, Energy performance of buildings - Ventilation for buildings - Part 5-1: Calculation methods for energy requirements of ventilation and air conditioning systems (Modules M5-6, M5-8, M6-5, M6-8, M7-5, M7-8) - Method 1: Distribution and generation

- EN 16798-7:2017, Energy performance of buildings - Ventilation for buildings - Part 7: Calculation methods for the determination of air flow rates in buildings including infiltration (Modules M5-5)
- EN 16798-9:2017, Energy performance of buildings - Ventilation for buildings - Part 9: Calculation methods for energy requirements of cooling systems (Modules M4-1, M4-4, M4-9) - General
- EN ISO 52000-1:2017, Energy performance of buildings — Overarching EPB assessment — Part 1: General framework and procedures
- EN ISO 52003-1:2017, Energy performance of buildings - Indicators, requirements, ratings and certificates - Part 1: General aspects and application to the overall energy performance (ISO 52003-1:2017)
- EN ISO 52016-1:2017, Energy performance of buildings — Energy needs for heating and cooling, internal temperatures and sensible and latent heat loads — Part 1: Calculation procedures
- EN ISO 52018-1:2017, Energy performance of buildings — Indicators for partial EPB requirements related to thermal energy balance and fabric features — Part 1: Overview of options
- EN ISO 52120-1:2022, Energy performance of buildings - Contribution of building automation and controls and building management - Part 1: Modules M10-4,5,6,7,8,9,10
- ISO 17772-1:2017, Energy performance of buildings — Indoor environmental quality — Part 1: Indoor environmental input parameters for the design and assessment of energy performance of buildings

For further details and recommendations, especially in the context of European Commission's standardization request as part of a policy recommendation, see the following Sub-Sections.

4.2 General standardization recommendations

Recommendation #1: Dynamic EPC system

According to the new EPBD 2024, the energy needs of a Zero Emission Building can be met through energy generated on-site or nearby from renewable sources, such as solar thermal energy, geothermal energy, solar photovoltaic energy, heat pumps, hydropower, biomass, renewable energy supplied by renewable energy communities, efficient district heating and cooling systems, and energy from other carbon-free sources. This change brings new challenges:

Participation in an energy community and the consumption of renewable energy from an installation owned by the Energy Community is not an inherent characteristic of the building under study; it is subject to change over time, potentially leading to various scenarios such as:

- Participation shares being variable over time.
- A participant in the energy community moving to a different home, which could result in the vacated dwelling losing its status as a Zero Emission Building or a specific energy rating.

This reality requires a dynamic and interoperable EPC (Energy Performance Certificate) system. The 'operational rating' methodology can be an approach to meet these new needs.

4.3 Standardization recommendations focusing on training and competences

Current practices for the assessment of energy performance of buildings and the issue of Energy Performance Certificates (EPCs) were developed at national and regional level in the first years of 21st century. A decade later, the set of European Standards were developed under standardization request (formerly known as mandate)

M/480[4] of the European Commission. This mandate tasked European Standardization Organizations with elaborating and adopting a methodology calculating the integrated energy performance of buildings and promoting the energy efficiency of buildings, in accordance with the terms set in the recast of the Directive on the energy performance of buildings (2010/31/EU) [3]. Member States progressively started the adaptation of their procedures to the new standards, but many are still not compliant.

While standardized methodologies ensure comparability between assessments, the lack of harmonized training poses a risk of tool misuse or misunderstanding, leading to inconsistent input data and potentially inaccurate results, even when using recognized and harmonized tools.

The SmartLivingEPC project has highlighted significant challenges in the training and qualification of assessors working with different assessment instruments like EPC, SRI (Smart Readiness Indicator), or BRP (Building Renovation Passport). A clear definition of the competences needed to conduct different assessments is required to ensure the appropriate alignment of qualifications with specific tasks. Addressing these issues is critical for fostering a harmonized and effective approach to energy performance evaluations.

Recently, a CEN preliminary work item (WI 00247143) on *Smart readiness indicator (SRI) assessor competencies* was registered under CEN/TC 247, *Building Automation, Controls and Building Management*[5]. Additionally, CWA 18193, *Standardized On-Site Audits of Smart Readiness Indicator (SRI) for Buildings*[6], which also establishes attributes, knowledge and skills for SRI auditors, was published recently.

SmartLivingEPC considers these initiatives as highly relevant and welcomed development. However, it is essential to extend the efforts beyond SRI assessments to encompass all relevant assessment types, ensuring consistency and comparability across EPC, SRI and BRP assessments.

Recommendation #2: Establish clear definitions of competences for assessment components

- To address disparities in the qualifications required to conduct energy performance assessments, a clear and harmonized framework defining the competences needed for each assessment component should be developed. This framework should explicitly outline who is qualified to carry out specific assessments, ensuring consistency, reliability, and comparability across Europe. By providing this clarity, stakeholders can align training programs and certification processes to meet shared standards, fostering a more effective and uniform implementation.
- Building upon the standardization work initiated at CEN level for SRI assessors, further efforts should be undertaken to expand competence definitions to include other assessment instruments like EPC and BRP.
- Similar to the standardization request M/480 which focused on methodologies for calculating the energy performance of buildings, the European Commission could issue a new standardization request to define the competences and qualifications necessary for performing assessments such as EPC, SRI, and BRP.

Recommendation #3: Develop harmonized training standards and tailored programs for energy performance assessments across Europe

- To support the professionalization of training of assessors in alignment with recognized European standards, tailored training programs that ensure consistency and quality in the application of different assessment types (e.g. EPC, SRI, BRP) are needed across Europe.
- The work initiated under the Preliminary Work Item at CEN level for SRI assessments should serve as a foundation for developing a broader, harmonized training approach also for EPC and BRP assessors.

[4] See https://energy.ec.europa.eu/publications/2010-european-commission-mandate-cen-m480_en

[5] See https://standards.cencenelec.eu/dyn/www/f?p=205:22:0::::FSP_ORG_ID,FSP_LANG_ID:6228,25&cs=1A00EE5D8D396BFC67013C770510F571E

[6] See https://standards.cencenelec.eu/dyn/www/f?p=205:110:0::::FSP_PROJECT:80013&cs=17223D91C28B50B3056AC1651360974EF

- As a baseline, the results of the CEN-CE Project results[7] could be further developed to establish general training guidelines. Additional training modules could be tailored according to the various assessment components.

[7] See https://www.cen-ce.eu/epb-standards-covered.html

4.4 Recommendations targeting specific standards

The following section presents SmartLivingEPC recommendations for improving specific existing standards. For better clarity, the standards are categorized based on the responsible European or international standardization body.

Recommendations for CEN/TC 156 – Ventilation for Buildings

EN 16798-1:2019, *Energy performance of buildings - Ventilation for buildings - Part 1: Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal environment, lighting, and acoustics - Module M1-6*:

Clause/ Subclause	Paragraph/ Figure/ Table	Type of comment (te = technical ge = general)	Comments	Proposed changes
6.2, 6.2.3		te	The standard sets that for buildings without mechanical cooling the indoor thermal comfort limits should be adaptive. However, the adaptive criteria are based on data for office building (or similar), where there is easy access to operable windows and occupants can freely adapt their clothing to the indoor thermal conditions. In this project, we cannot expect to collect such information (e.g. the possibility to open the windows) from the rooms and therefore we chose to use the limits from table B.5 for operational IEQ assessment (based on indoor air temperature).	As this standard is used also for operational IEQ assessment, the section 6.2 in general or 6.2.3 could include some suggestions implementing the method for operational assessment. Suggest adding conditions, when we should use more strict limits for thermal comfort (e.g., if we do not know about the operable windows). We found that using table B.5 for the limits in our pilot buildings will work with the clause that during between heating and cooling seasons (shoulder season) the limit will be the widest. This approach will give low IEQ category for not mechanically cooled rooms but will indicate the actual thermal comfort in the building.
		ge	Standard does not give criteria for other IEQ indicators like PM2.5. We used limits from WHO guidelines.	Suggestion is to add PM2.5 (and also other critical IEQ indicators) category limits to the standard. We used EU and WHO air quality directives and guidelines for harmful pollutants[8].

[8] https://www.eea.europa.eu/themes/air/air-quality-concentrations/air-quality-standards

Clause/ Subclause	Paragraph/ Figure/ Table	Type of comment (te = technical ge = general)	Comments	Proposed changes
		ge	Lately, the virus risk assessment is very actual. We did not get this information from standards, but used the guideline developed by REHVA.	Suggestion is to add virus risk assessment category limits to the standard. We used REHVA proposal to calculate the categories limits: Health-based target ventilation rates and design method for reducing exposure to airborne respiratory infectious diseases. Also, our deliverable 3.4 section 2.4.2.3 will have some suggestions for the operational virus risk assessment. Deliverable 3.4 is publicly available for download[9].
		ge	While comprehensive, some elements could benefit from further clarification regarding practical implementation, such as defining thresholds for indoor air quality under variable occupancy.	Introduce examples or case studies, such as buildings with mixed-use spaces, to enhance clarity and application. Consider aligning methodologies with SmartLivingEPC's focus on using real-time data from smart meters for operational energy analysis.
		ge	SmartLivingEPC supports the identified fields of action indicated in the Roadmap for the set of EPB standards [2], which are: To cover all IEQ aspects, with an emphasis on thermal comfort indicators and IAQ. Additionally, the project recommends adding additional dimensions to thermal comfort like acoustic comfort and visual comfort which may require additional energy inputs.	

[9] https://www.smartlivingepc.eu/en/Project%20Results%20%20Documents/Deliverables/D3.4%20Operational%20assessment%20methodology%20at%20building%20level%20v2.pdf

CEN/TR 16798-2:2019, *Energy performance of buildings - Ventilation for buildings - Part 2: Interpretation of the requirements in EN 16798-1 - Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal environment, lighting and acoustics (Module M1-6)*:

Clause/ Subclause	Paragraph/ Figure/ Table	Type of comment (te = technical ge = general)	Comments	Proposed changes
Annex D		te	The Annex D is about the long-term evaluation of the general thermal comfort conditions. The methods are using operative temperature, but in our framework, we have only indoor air dry-bulb temperature measurements from room temperature sensors.	To add information for the situation, when we cannot measure operative temperature. Maybe more strict limits for the occasion.
Annex E		te	If we want to give out one final IEQ score, the Annex E for the calculations of the categories did not work for us. We need one value for each indicator, but this will give out two percentages for the length of deviations for detecting the categories (e.g., in E.2 and table E.1 there are two suggested percentages for the length of deviations).	We suggest considering the Level(s) framework and TAIL [4] methodologies that are more applicable for the operational IEQ performance assessment. It will use 5%/1% criteria, that will give out one category. We suppose, the Deliverable 3.4 and sections 2.4-2.8 are good examples, how the standards, Level(s) and TAIL methodologies are combined and implemented in operational IEQ performance assessment. This input could give good feedback for the development of the standard. Deliverable 3.4 of the SmartLivingEPC project is publicly available[10].

[10] https://www.smartlivingepc.eu/en/Project%20Results%20%20Documents/Deliverables/D3.4%20Operational%20assessment%20methodology%20at%20building%20level%20v2.pdf

Recommendations for CEN/TC 228 – Heating systems and water-based cooling systems in buildings

EN 15316-4-2:2017, ***Energy performance of buildings - Method for calculation of system energy requirements and system efficiencies - Part 4-2: Space heating generation systems, heat pump systems, Module M3-8-2, M8-8-2*****:**

Clause/ Subclause	Paragraph/ Figure/ Table	Type of comment (te = technical ge = general)	Comments	Proposed changes
		ge	EN 15316-4-2 heat pumps lack of clarity and data (table missing), there are too few explanations about the physical phenomenon, the technical report is not presenting anything new relative to the standard, the presentation in standard doesn't follow the calculation procedure, topics are mixed, lot of equations with errors etc.	
		ge	SmartLivingEPC supports the identified fields of action indicated in the Roadmap for the set of EPB standards [2], which are: To extend with chillers and simultaneous heating and cooling (taking over from EN 16798-13) To improve the link with product data	

EN 15378-1:2017, ***Energy performance of buildings - Heating systems and DHW in buildings - Part 1: Inspection of boilers, heating systems and DHW, Module M3-11, M8-11*****:**

Clause/ Subclause	Paragraph/ Figure/ Table	Type of comment (te = technical ge = general)	Comments	Proposed changes
		ge	Certain aspects may need revisions to align with modern practices, such as the integration of renewable heating technologies.	Update inspection guidelines to include advancements like data-driven diagnostics and predictive maintenance tools. Align the application of the standard with SmartLivingEPC's goals by emphasizing consistency in operational assessment frameworks.

Recommendations for CEN/TC 371 – Energy Performance of Buildings

EN ISO 52000-1:2017, *Energy performance of buildings - Overarching EPB assessment - Part 1: General framework and procedures (ISO 52000-1:2017)* (CEN lead)**:**

Clause/ Subclause	Paragraph/ Figure/ Table	Type of comment (te = technical ge = general)	Comments	Proposed changes
9.5.1		te	According to the new EPBD 2024, the energy needs of a Zero Emission Building can be met through energy generated on-site or nearby from renewable sources, such as solar thermal energy, geothermal energy, solar photovoltaic energy, heat pumps, hydropower, biomass, renewable energy supplied by renewable energy communities, efficient district heating and cooling systems, and energy from other carbon-free sources. This change brings new challenges.	Section 9.5.1 and Section 9.5.2 - The definition 'nearby' requires further definition. In Spain, for example, a radius of 2 km has been adopted in the case of a collective photovoltaic installation. However, the standard does not define the limit of "nearby." This lack of definition may lead to heterogeneity among different countries. This, to some extent, may also be related to the lack of definition of the assessment boundary when the assessment considers more than one building: The new EPBD definition leaves the option open to consider an energy exchange between buildings. This makes an assessment of several buildings at once more realistic. In the SmartLivingEPC project, the same lack of definition of the complex building assessment boundary has arisen.
		ge	The overarching framework offers flexibility but might lack specific guidance for certain scenarios, such as urban retrofit projects with heritage constraints.	Add more specific instructions, such as modelling techniques for energy performance in complex urban environments. SmartLivingEPC's findings on lifecycle cost analysis could complement this framework for improved decision-making. For a comprehensive Life Cycle Assessment (LCA) of the FRC pilot building, please refer to Deliverable 2.4[11], and Chapter 4.4 of Deliverable 2.7[12] .

[11] https://www.smartlivingepc.eu/en/Project%20Results%20%20Documents/Deliverables/D2.4%20Asset%20methodology%20assessment%20in%20building%20level%20v2.pdf

[12] https://www.smartlivingepc.eu/en/Project%20Results%20%20Documents/Deliverables/D2.7%20Asset%20rating%20calculation%20methodology%20of%20SmartLivingEPC%20v3.pdf

Clause/ Subclause	Paragraph/ Figure/ Table	Type of comment (te = technical ge = general)	Comments	Proposed changes
		ge	SmartLivingEPC supports the identified fields of action indicated in the Roadmap for the set of EPB standards [2], which are: To review terms and definitions, for effective and unambiguous implementation of revised EPBD in practice and to promote conversion with other directives. To include energy storage. To include procedure and profiles for smart (dis-)charging of electric vehicles or other electric storage capabilities. Additionally, the project recommends including more detailed information regarding the assessment boundary to enable the evaluation of the energy performance on the complex level. When assessing the energy performance on the complex level, it is often unclear where to draw the line on what is inside the boundary of the building and what is considered outside the boundary of the building, especially in cases where buildings belong to an energy community.	

Recommendations for ISO/TC 163 – Thermal performance and energy use in the built environment

ISO 17772-1:2017, *Energy performance of buildings — Indoor environmental quality — Part 1: Indoor environmental input parameters for the design and assessment of energy performance of buildings*

Clause/ Subclause	Paragraph/ Figure/ Table	Type of comment (te = technical ge = general)	Comments	Proposed changes
		ge	SmartLivingEPC supports the identified fields of action indicated in the Roadmap for the set of EPB standards [2], which are: To cover all IEQ aspects, with an emphasis on thermal comfort indicators and IAQ. Additionally, the project recommends adding additional dimensions to thermal comfort like acoustic comfort and visual comfort which may require additional energy inputs.	

Recommendations for ISO/TC 163/SC 2 – Calculation methods

EN ISO 52016-1:2017, ***Energy performance of buildings — Energy needs for heating and cooling, internal temperatures and sensible and latent heat loads — Part 1: Calculation procedures*** (ISO lead)**:**

Clause/ Subclause	Paragraph/ Figure/ Table	Type of comment (te = technical ge = general)	Comments	Proposed changes
		ge	SmartLivingEPC supports the identified fields of action indicated in the Roadmap for the set of EPB standards [2], which are: To unambiguously specify the interaction with other EPB standards (systems, ventilation) To integrate thermal comfort indicators (from ISO 17772-1 or EN 16798-1 or successors) Additionally, the project recommends adding additional dimensions to thermal comfort like acoustic comfort and visual comfort which may require additional energy inputs.	

EN ISO 52018-1:2017, ***Energy performance of buildings — Indicators for partial EPB requirements related to thermal energy balance and fabric features — Part 1: Overview of options*** (ISO lead)**:**

Clause/ Subclause	Paragraph/ Figure/ Table	Type of comment (te = technical ge = general)	Comments	Proposed changes
		ge	SmartLivingEPC supports the identified fields of action indicated in the Roadmap for the set of EPB standards [2], which are: To review needs for specific information for EP certificates. Additionally, the project recommends including SRI and sustainability indicators for asset and operational assessment.	

Recommendations for ISO/TC 205 - Building environment design

EN ISO 52003-1:2017, ***Energy performance of buildings - Indicators, requirements, ratings and certificates - Part 1: General aspects and application to the overall energy performance (ISO 52003-1:2017)*** **(**ISO lead)**:**

Clause/ Subclause	Paragraph/ Figure/ Table	Type of comment (te = technical ge = general)	Comments	Proposed changes
		ge	SmartLivingEPC supports the identified fields of action indicated in the Roadmap for the set of EPB standards [2], which are: To review the list and specification of indicators, requirements and ratings in the context of the revised EPBD and its instruments (EP certificate, renovation passport. IEQ, …) Additionally, the project recommends including SRI and sustainability indicators for asset and operational assessment.	

EN ISO 52120-1:2022, *Energy performance of buildings - Contribution of building automation, controls and building management - Part 1: General framework and procedures (ISO 52120-1:2021)* **(**ISO lead**):**

Clause/ Subclause	Paragraph/ Figure/ Table	Type of comment	Comments	Proposed changes
5, 5.4		te	The default smart-ready service catalogue for the SRI is largely based on section 5.4 (clause 5). However, it includes technical domains which are not covered therein (e.g., dynamic building envelope, electricity, EV charging). As per EPBD IV, the SRI and EPC issuance are to be coordinated. Pathways to that are either Method 1 (clause 6) or Method 2 (clause 7) Without adaptation of the standard, only part of the SRI could be streamlined with EPB assessments and EPCs.	I would advise exploring the extension of section 5.4 (clause 5) to cover all technical domains in the SRI framework. Outcomes of SmartLivingEPC Task 2.1 do describe pathways for coordination of SRI with EPB assessments, notably related to the standard. The outcomes are included in Deliverable 2.4[13].
		ge	SmartLivingEPC supports the identified fields of action indicated in the Roadmap for the set of EPB standards [2], which are: To make the links to and inside the system standards more concrete.	

Recommendations for ISO/TC 268 - Sustainable cities and communities

ISO 37120:2018, *Sustainable cities and communities — Indicators for city services and quality of life*:

Clause/ Subclause	Paragraph/ Figure/ Table	Type of comment (te = technical ge = general)	Comments	Proposed changes
		ge	Indicators are broad, making it challenging to measure specific neighbourhood-level sustainability efforts, such as bike lane integration.	Add a specific item to measure the presence of bike lanes in the assessed area. It could be done by using cartographic maps of the municipality, drones, satellite images, among others.

[13] https://www.smartlivingepc.eu/en/Project%20Results%20%20Documents/Deliverables/D2.4%20Asset%20methodology%20assessment%20in%20building%20level%20v2.pdf

Recommendations for IEC/TC 64 – Electrical installations and protection against electric shock

IEC 60364-8-1:2019, *Low-voltage electrical installations – Part 8-1: Functional aspects – Energy efficiency*:

Clause/ Subclause	Paragraph/ Figure/ Table	Type of comment (te = technical ge = general)	Comments	Proposed changes
8.5/8.6		te	The Standard promotes performance monitoring and management of the electrical installation but does not specify detailed methodologies or other standards for installing electrical energy management systems (EEMS)	The Standard could provide more specific guidelines or reference other standards in sections 8.5 and 8.6.
		ge		The Standard could be aligned more closely with the SmartLivingEPC concept, by mentioning advanced energy monitoring systems and methodologies for integrating smart energy meters and Building Energy Management Systems (BEMS)

IEC TS 60364-8-3:2020, *Low-voltage electrical installations – Part 8-3: Functional aspects – Operation of prosumer's electrical installations*:

Clause/ Subclause	Paragraph/ Figure/ Table	Type of comment (te = technical ge = general)	Comments	Proposed changes
9		ge	The Standard mentions analytics and AI services for optimization of the power supplies usage, but does not provide specific recommendations for AI-driven optimization	The Standard could include AI optimization recommendations in section 9 and provide examples of services towards optimization and efficient use of power load in the installation, such as predictive load forecasting based on historical data and weather patterns.

5 Conclusions

The deliverable “policy recommendations” has successfully addressed the need to revise existing European and International standards as well as to propose new standardization activities aimed at clearly defining the competences required to carry out energy performance assessments as well as tailored training programmes to acquire these competences.

At the beginning 211 published standards and standards under development constitute the standardization landscape of SmartLivingEPC. After an in-depth study of these standards, the most important ones were analyzed, taking into account the findings from their implementation by SmartLivingEPC as well as external sources such as the roadmap for the set of EPB standards. This resulted in concrete recommendations for the revision of 13 of the 211 previously identified standards.

Another important result are recommendations regarding a dynamic EPC system and on training and competences not addressed in current standardization activities.

If not stated otherwise policy issues are embedded in the respective recommendations.

In conclusion, the deliverable's outcomes, i.e. recommendations, significantly demonstrate the proactive contribution of SmartLivingEPC to standardization in the framework of advanced Energy Performance Assessment towards Smart Living in Building and District Level.

6 References

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[2] Roadmap for the set of EPB standards with regard to the key global challenges, prepared by ISO/TC 205 & 163 Joint Advisory Group on coordination of the ISO 52000 family EPB standards and CEN/TC 371 Task Group on Systematic Review/Standardization Request & EPBD4, Version 2024-02-24 https://epb.center/media/filer_public/30/4e/304e16d7-c4c0-4639-83f6-dd902d596511/roadmap_for_upgrading_set_of_iso-cen_epb-standards_v_2024-02-24.pdf

[3] Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings (recast) https://eur-lex.europa.eu/eli/dir/2010/31/oj

[4] Pawel Wargocki, Wenjuan Wei, Jana Bendžalová, Carlos Espigares-Correa, Christophe Gerard, Olivier Greslou, Mathieu Rivallain, Marta Maria Sesana, Bjarne W. Olesen, Johann Zirngibl, Corinne Mandin. *TAIL, a new scheme for rating indoor environmental quality in offices and hotels undergoing deep energy renovation* (EU ALDREN project), Energy and Buildings, Volume 244, 2021

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https://www.smartlivingepc.eu/en/

https://www.linkedin.com/company/smartlivingepc/

https://twitter.com/SmartLivingEPC

https://www.youtube.com/channel/UC0SKa-20tiSabuwjtYDqRrQ

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