JOINED RESOURCE FOR

EPC & SRI PRACTICE COLLECTION

tunES: Tuning EPC and SRI instruments to deliver full potential

Objective

The objective of the collection is to identify, describe and iterate already successfully or currently tested practices on EPC and SRI design, deployment and implementation.

tunES will use the results to drive the national implementation plan of revised EBPD and make all technological advance available to all national energy agencies and responsible ministries.

Structure

tunES describes the entire scope of EPC and SRI projects in five major building blocks. Each practice is linked to at least one of the following building blocks:

- **Understanding EPC** collects practices on how the EPC itself or linked results can be better understood by all involved stakeholders.
- **Upgrading EPC** collects practices on improving and optimising EPC methodology, generation process or indicators.
- **Databases and Tools** collects practices on (existing or new) data infrastructure and tools requiring central or federated data management.
- **SRI Development and Deployment** collects practices implementing SRI calculation methodology and necessary processes as well as linked use cases.
- **Integration of Instruments** collects practices that integrate EPC and SRI and/or achieve harmonisation, efficiency and interoperability across EPC, SRI and other tools.

How to find your practices?

See section 1.2.2 in table of content or navigation (via CTRL+F) where practices are cross-linked by project.

If you need to find practice related to a specific EPBD article, use the navigation (via CTRL+F) and type EPBD-x, where x represents the article number you need. For example, EPBD-8.

How to contribute?

Projects listed are invited to edit, update and improve the description of the practices identified. Projects missing can add new entries with the template in section 1.1.

Please use track changed and comments function. The practice titles are work in progress, please use comments to suggest a change as the file uses cross-referencing.

The results can be freely used provides tunES and authors are referenced. tunES will clear the file and generate a PDF-compendium in regular intervals.

How will the collection evolve?

Over time, tunES will incorporate references to EPBD revision and categorise practices accordingly.

This project has received funding from the European Union's funding instrument for the environment and climate action (LIFE programme) under grant agreement No 101120926.

How will / can the results be used? Attribution?

Within tunES, the results built the basis for seven energy agencies (and any which follows) to prepare the policy implementation of EPC & SRI. We will document progress with edited iterations of a deliverable.

Beyond tunES, the results are freely available and you can be utilised provided they are attributed to tunES and authors at empirica. To the extent we are able, we will record and make visible all contributors in the living document and in our deliverables.

Contact and support

You can use cluster channel conversations or tag to Georg Vogt, Petr Popov, Tatiana Novikova or write to tunES@empirica.com.

Authors: Georg Vogt, Petr Popov, Tatiana Novikova (all empirica)

Contributors: to be recorded to the extent it can be identified (best write name in comment)

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Contents

1 Overview

1.1 Fields for each practice / template

Descriptive title for practice

Country(s)	Countries where a practice is/was implemented.
Source	Project information links such as websites and reports.
Contact details	Contact information of individuals responsible for implementing practices in a project.
LATER: EPBD Recast	List to which EPBD requirements the practice contributes
Problem/Motivation	Underlying reason or cause that prompted the development or implementation of the practice.
Short description of practice	Short description of practice as implemented with given context to status quo where relevant - in case of multiple locations the description is split with paragraphs.
Evidence on impact	How was the impact of a practice measured, including the type, size, and impact that was measured.
Lessons learnt / recommendations for large-scale roll-out:	What recommendations are proposed for large-scale implementation after impact assessment?
Policy measures required for large-scale deployment	What are the recommended policy measures for the large-scale implementation of a practice?
Evaluation of policy measure	How could the success of the practice be evaluated (3-5 years) after policy was implemented?

Note: to add new practice copy the abovementioned template

1.2 Lists of practices

1.2.1 Listed by section

Understanding EPC

- Improving renovation recommendations on EPCs towards deep energy renovation
- Online tool for comparing EPC recommendations to deep energy renovation recommendation
- Stakeholder Analysis and Interviews
- Status Overview Collection EPCs across MS
- Analysis of the current EPC Methodologies in 10 countries
- Analysis of existing EPC attitudes and needs
- Inventory of similar EU projects

- Analysis of available KPIs and scales from Horizon2020 projects and partner countriesAnalysis of available KPIs and scales from Horizon2020 projects and partner countries
- Harmonised verification framework for quality checking EPC outputs
- Linking next-generation of EPCs to energy audits, logbooks and BRPs
- CrossCert Infographics
- Integration of a new set of indicators (SRI Method B, among others) into NG EPCs using the D^2EPC web platform
- Recommendations for harmonisation process
- Indicator Development for EPC Contextual Analysis
- Identification of Gaps in Current Sustainability Frameworks
- Development and Implementation of an Energy-Efficient Building Renovation Planner
- Development of an Investment Appraiser for Building Performance and Energy Saving Investments
- Development of apps for both residents (ChroViewOcc) and professionals (ChroViewPlus) to understand and improve energy consumption
- Development of EMPOWER (Energy Monitoring POrtal for aWare usERs) to monitor energy consumption and improve the awareness of users

Upgrading EPC

- Enhancing EPCs by incorporating Building Renovation Passport (BRP)
- Standardised Procedure for EPC Enhancement with Specialist Input
- iBRoad2EPC Assistant Tool for Enhanced EPCs
- iBRoad2EPC Additional Modules for Enhanced EPCs
- Using Building Information Modelling (BIM) for the EPC generation process
- Integrated District Energy Assessment for EPCs
- Comprehensive Indoor Comfort Assessment in EPCs
- Integrated Environmental and Health Impact Assessment in EPCs
- Behavioural Impact Analysis and Performance Gap Closure via EUB SuperHub Platform
- Performance assessment using well-defined Key Performance Indicators (KPIs)
- Process Upscaling for EPC Methodology Improvement
- Recommendation for Cloud System Roll-Out
- EPC RECAST Certificate and Renovation Roadmap
- Cross exploitation of energy-related measured data and EP modelling
- Data acquisition protocol for the geometry and semantics within the onsite visit
- EPC Data and EP assessment method from ISO/CEN
- EU-standards compliance report and guidelines
- Incorporation of non-energy aspects to building assessment
- Introduction of new rating scheme at the building complex level
- Recommendations on integration of Next-generation dynamic EPC in national certification scheme
- EPC and Indoor Environment Quality Integration
- Improving building operation with enhanced EPCs
- Development of digital building logbooks - new generation of EPCs
- Update to U-values and heat loss requirements in Hungary
- The new CO2 emission requirements for EPC in Hungary
- EPC classification changes in Hungary

- Introduction of Renovation Passport in Hungary

Databases and Tools

- Characteristics of a successful EPC scheme
- Implementation of a Semantically Enriched Building Information Modelling Based Common Data Environment (CDE)
- 3D Visualisation & Monitoring Platform (ChroViewFM) for monitoring real-time data from smart equipment
- Knowledge Exchange Centre for EPCs
- Interoperability of EPC Databases
- Integrating Implemented Building Performance Tools into a Digital Building Logbook
- Building Repository-Enhanced EPC Management
- Characteristics of a successful EPC database
- Development of digital One-stop-shop platform built upon Digital Building Logbook
- Harmonisation of Datasets of Energy Performance Certificates of Buildings across Europe
- National database for EPCs (OÉNY)National database for EPCs (OÉNY)
- Evaluation of the proposed digital tools in the CHRONICLE project – survey results
- Assessment of tools for the calculation of the EPC and the SRI
- European Atlas of EPC Tools

SRI Development and Deployment

- Development of Web-based SRI Assessment Toolkit
- SRI Decision Support ToolSRI Decision Support Tool
- Training and Capacity Building for SRI Auditors in SRI-ENACT
- Stakeholder Engagement in Co-creation of SRI-ENACT Tools and Services
- Recommendations on introducing SRI into national regulation
- Public Funding Schemes for SRI Upgrades
- SRI2MARKET Tool SuiteSRI2MARKET Tool Suite
- Automated SRI Calculation and Machine Learning Services
- Advanced SRI Assessment and Ethical Conduct in TIMEPAC Project
- Smart readiness and Life Cycle Analysis Integration
- Integration of SRI Indicators into next generation EPCs
- Policy implications and national priorities
- Training packages and guidance for certification
- Preliminary evaluation of the Smart Readiness Indicator of existing buildings in the Italian building stock
- Analysis, application and validation of the Smart Readiness Indicator calculation methodology in the Italian building context
- Conceptualisation of the benefits of building smartness from the perspectives of carbon-neutral energy system in the Smart-Ready Buildings project
- Policy context for the SRI
- E-learning program on SRI assessments
- SRI and SRI-ENACT Assessment Toolkit testing in Bulgaria
- SRI assessment case study: GREEN POINT BUILDING in Austria
- Adaptation of SRI methodology to specific regional and climatic characteristics
- Application of method A to assess the readiness of buildings for intelligent solutions
- Preliminary results of the SRI assessment of the first buildings in the Czech Republic

- Assessment of Smart Readiness Indicators in Spain
- Assessment of Smart Readiness Indicators in Romania
- SRI Observatory
- Smart Square tools – Smart-Ready-Go; Smart Readiness Virtual Training Centre

Integration of Instruments

- Use of Smart Readiness Indicator methodology for Integration in EPC schemes
- Cross-assessment of EPC
- Development and Implementation of a Digital Twin Framework for Building Performance Monitoring and Simulation
- Development of a holistic and modular EPC methodology
- Use of Smart Readiness Indicator methodology into EUB digital passport
- Guidelines for EPC enhancement at EU level through TIMEPAC Academy
- Building Renovation Passports from enhanced EPC data
- Integration roadmap of SRI into EPC
- SRI integration roadmap to digital building logbooks
- Joint EPC and SRI audit process
- Use of Smart Readiness Indicator methodology into EUB digital passport

1.2.2 Listed by project

CHRONICLE

- 3D Visualisation & Monitoring Platform (ChroViewFM) for monitoring real-time data from smart equipment
- Development and Implementation of a Digital Twin Framework for Building Performance Monitoring and Simulation
- Development and Implementation of an Energy-Efficient Building Renovation Planner
- Development of an Investment Appraiser for Building Performance and Energy Saving Investments
- Development of apps for both residents (ChroViewOcc) and professionals (ChroViewPlus) to understand and improve energy consumption
- Implementation of a Semantically Enriched Building Information Modelling Based Common Data Environment (CDE)
- Interoperability of EPC Databases
- Integrating Implemented Building Performance Tools into a Digital Building Logbook
- Performance assessment using well-defined Key Performance Indicators (KPIs)
- Evaluation of the proposed digital tools in the CHRONICLE project – survey results

CrossCERT

- Analysis of existing EPC attitudes and needs
- Analysis of the current EPC Methodologies in 10 countries
- Building Repository-Enhanced EPC Management
- Cross-assessment of EPC
- Knowledge Exchange Centre for EPCs
- Inventory of similar EU projects
- Interoperability of EPC Databases
- Analysis of available KPIs and scales from Horizon2020 projects and partner countries
- Harmonised verification framework for quality checking EPC outputs

- Linking next-generation of EPCs to energy audits, logbooks and BRPs
- CrossCert Infographics

D^2EPC

- Recommendations on integration of Next-generation dynamic EPC in national certification scheme
- Integration of a new set of indicators (SRI Method B, among others) into NG EPCs using the D^2EPC web platform
- Integration of SRI Indicators into next generation EPCs

easySRI

- Automated SRI Calculation and Machine Learning Services
- Policy implications and national priorities
- Training packages and guidance for certification

ePANACEA

- Stakeholder Analysis and Interviews
- Development of a holistic and modular EPC methodology

EPC RECAST

- Recommendations for harmonisation process
- Indicator Development for EPC Contextual Analysis
- Process Upscaling for EPC Methodology Improvement
- Recommendation for Cloud System Roll-Out
- EPC RECAST Certificate and Renovation Roadmap
- Cross exploitation of energy-related measured data and EP modelling
- Data acquisition protocol for the geometry and semantics within the onsite visit
- EPC Data and EP assessment method from ISO/CEN
- EU-standards compliance report and guidelines

EUB SuperHub

- Behavioural Impact Analysis and Performance Gap Closure via EUB SuperHub Platform
- Development of digital building logbooks - new generation of EPCs
- Development of digital One-stop-shop platform built upon Digital Building Logbook
- Use of Smart Readiness Indicator methodology into EUB digital passport

iBRoad2EPC

- Enhancing EPCs by incorporating Building Renovation Passport (BRP)
- Standardised Procedure for EPC Enhancement with Specialist Input
- iBRoad2EPC Assistant Tool for Enhanced EPCs
- iBRoad2EPC Additional Modules for Enhanced EPCs

QualDeEPC

- Improving renovation recommendations on EPCs towards deep energy renovation
- Online tool for comparing EPC recommendations to deep energy renovation recommendationBuilding automation
- Characteristics of a successful EPC scheme

SmarterEPC

- Joint EPC and SRI audit process
- European Atlas of EPC Tools

Smart Living EPC

- Identification of Gaps in Current Sustainability Frameworks
- Incorporation of non-energy aspects to building assessment
- Introduction of new rating scheme at the building complex level
- Smart readiness and Life Cycle Analysis Integration
- EPC and Indoor Environment Quality Integration

SRI2MARKET

- Recommendations on introducing SRI into national regulation
- Public Funding Schemes for SRI Upgrades
- SRI2MARKET Tool Suite
- Policy context for the SRI
- E-learning program on SRI assessments

SRI-ENACT

- Development of Web-based SRI Assessment Toolkit
- SRI Decision Support Tool
- Training and Capacity Building for SRI Auditors in SRI-ENACT
- Stakeholder Engagement in Co-creation of SRI-ENACT Tools and Services
- SRI and SRI-ENACT Assessment Toolkit testing in Bulgaria
- SRI assessment case study: GREEN POINT BUILDING in Austria
- Adaptation of SRI methodology to specific regional and climatic characteristics
- Application of method A to assess the readiness of buildings for intelligent solutions
- Preliminary results of the SRI assessment of the first buildings in the Czech Republic
- Assessment of Smart Readiness Indicators in Spain
- Assessment of Smart Readiness Indicators in Romania

Smart Square

- Integration roadmap of SRI into EPC
- SRI integration roadmap to digital building logbooks
- SRI Observatory
- Smart Square tools – Smart-Ready-Go; Smart Readiness Virtual Training Centre

TIMEPAC

- iBRoad2EPC Additional Modules for Enhanced EPCs
- Using Building Information Modelling (BIM) for the EPC generation process
- Advanced SRI Assessment and Ethical Conduct in TIMEPAC Project
- Guidelines for EPC enhancement at EU level through TIMEPAC Academy
- Improving building operation with enhanced EPCs
- Building Renovation Passports from enhanced EPC data

U-CERT

- Status Overview Collection EPCs across MS

X-tendo

- Integrated District Energy Assessment for EPCs
- Comprehensive Indoor Comfort Assessment in EPCs
- Integrated Environmental and Health Impact Assessment in EPCs
- Use of Smart Readiness Indicator methodology for Integration in EPC schemes

EPC4EU

- Harmonisation of Datasets of Energy Performance Certificates of Buildings across Europe

2 Understanding EPC

2.1 Summary – to follow

2.2 Practices

Improving renovation recommendations on EPCs towards deep energy renovation

Country(s)	Bulgaria, Germany, Greece, Hungary, Latvia, Spain, Sweden
Source (project info links)	https://qualdeepc.eu/ QualDeEPC – Deliverable D3.2 White Paper on good practice in EPC assessment, certification, and use, p. 18-23 QualDeEPC- Deliverable D4.5 Summary evaluation report p 18-38
Contact details	mail@qualdeepc.eu
LATER: EPBD Recast	EPBD-8, EPBD-9,
Problem/Motivation	Currently, renovation recommendations in EPCs in most European countries are limited to low–cost measures or to reach minimum legal requirements. Such recommendations may not be the most cost-effective actions taken. Often no recommendations are given on deep energy renovation leaving owners unaware of the potential.
Short description of practice as implemented	The developed guidance describes high-quality renovation recommendations and how these should be selected and presented on EPCs. Moreover, the energy rating was proposed with 'traffic light system' for individual recommendations for building envelope and technical systems in order to support staged deep renovation.
Evidence on impact	The results showed significant potential for improvement in the existing EPCs and convergence between various member states. In most countries, the number of recommendations and their ambition increased in the enhanced EPCs that provide a clear list of options,and almost 50% of energy savings potential were suggested in the enhanced EPCs. The total energy savings potential in the 98 pilot buildings was found to be 18,3 GWh per year.

Lessons learnt / recommendations for large-scale roll-out:	The specific renovation recommendations selected by EPC assessors/issuers differ by country because of specific climate zones, national requirements and building standards, and the uncertainty about the interpretation of "cost-effectiveness". Often "typical" values are hard to specify because no official documentation about renovation recommendations exist.
Policy measures required for large-scale deployment	• Create guidance on recommendations toward 'deep energy renovation' sorted by themes: ○ External wall insulation ○ Roof insulation ○ Insulation of ceiling of an unheated basement/ ground floor ○ Window replacement ○ Door replacement ○ Replacement/ Installation of shading ○ Replacement/ installation of the mechanical ventilation system ○ Replacement/ modernisation of the heating system ○ Replacement/ modernisation of the cooling system ○ Replacement/ modernisation of the DHW system ○ Integration of renewable energy sources ○ Lighting ○ Reduction of thermal bridging ○ Increased air tightness ○ Building automation
Evaluation	The renovation recommendations were included and tested as part of the testing phase of the project via the enhanced EPC form proposed by the QualDeEPC. The testing phase included 98 pilot cases/buildings in the 7 participating countries both residential (61) and non-residential (37). The evaluation results were mainly derived from 1) a comparison of the standard and enhanced EPCs (general and for pilot buildings), 2) questionnaires answered by pilot building representatives, and 3) stakeholder roundtable meetings at national level. A key result from the transnational comparison of the of the standard and enhanced EPCs showed on average that the Enhanced EPCs presented an average energy savings potential of 49.4%. The building representatives found a proposed feature called 'traffic light system' that classified the efficiency of building envelope and technical systems, and the information on energy and cost savings to be informative.

Online tool for comparing EPC recommendations to deep energy renovation recommendation

Country(s)	Bulgaria, Germany, Greece, Hungary, Latvia, Spain, Sweden

Source (project info links)	https://qualdeepc.eu/ QualDeEPC – Deliverable D3.2 White Paper on good practice in EPC assessment, certification, and use, p. 24-33 QualDeEPC- Deliverable D4.5 Summary evaluation report p 30-32 & 77-78
Contact details	mail@qualdeepc.eu
EPBD Recast	Articles EPBD-19, EPBD-14, EPBD-8, EPBD-16, EPBD-12, EPBD-18, EPBD-29
Problem/Motivation	Regular homeowners have no means of assessing which renovation measures can be taken and which impact they have.
Short description of practice as implemented	By entering the information provided by the EPC (location, envelope, technical systems), the QualDeEPC tool calculates and informs regular homeowners about simulated renovations and the resulting energy performance of the dwellings/multifamily building. The tool informs users about which measures would be required to achieve higher levels of energy performance, corresponding to deep renovation. The QualDeEPC tool (Master version) was based on the existing Greek Home Energy Check tool (HEC) enriched with the new features in terms of elements (e.g., further building types), systems and recommendations, The proposed recommendations are presented in a prioritised manner and included in the relevant lists for improving energy efficiency, so as the user to get familiar with the typical order of implementing such measures avoiding any damages of the systems in the future or lock-in effects. The output includes the calculated energy class before and after renovation of the building, indicative costs and savings, the CO2 emissions reduction (in %) which can be used to seek professional advice about the viability of performing the renovation.
Evidence on impact	
Lessons learnt / recommendations for large-scale roll-out:	Overall, the online tool received wide acceptance from the stakeholders. On national level, these platforms should be operated by the energy agencies, which will give the possibility to consult them not only online, but also physically and receive the required support from them. The cost related information is perceived too unreliable due to the dynamically fluctuating market environment. However, this could be overcome by annually updating the cost database.
Policy measures required for large-scale deployment	Provide citizens with a simplified simulation tool for deep energy renovations.
Evaluation	The evaluation for the online tool was mainly based on the interviews with pilot building representatives and stakeholder roundtable

	meetings at national level. Most stakeholders have expressed interest in the information provided in such an online tool and in many of its features, suggesting that stakeholders in most countries have similar needs. The implementation of such tools in more countries could support the increase convergence of EPC schemes in MS.

Stakeholder Analysis and Interviews

Country(s)	Austria, Belgium, Finland, Germany, Greece, Spain
Source (project info links)	https://epanacea.eu/, ePANACEA – Stakeholder Analysis
Contact details	contact@epanacea.eu
EPBD Recast	Articles EPBD-30, EPBD-18, EPBD-19, EPBD-29
Problem/Motivation	Need to comprehensively grasp the diverse perspectives, needs, and challenges surrounding EPCs. Lack of accuracy, a gap between theoretical and real consumption patterns, absence of proper protocols for inclusion of smart and novel technologies, little convergence across Europe, lack of trust in the market and very little user awareness related to energy efficiency
Short description of practice as implemented	The practice entailed a detailed examination of EPC end users and other influential stakeholders. The approach involved a thorough literature review, collaboration with partners across multiple countries, and the development of general and country-specific stakeholder maps. This foundational work was designed to guide subsequent interviews and workshops, aimed at understanding stakeholder interactions with EPCs and shaping future iterations to better meet user needs.
Evidence on impact	• The project conducted 63 interviews across six countries, with 38 involving end users and 25 with other stakeholders. These interviews informed the design of user-needs workshops, where participants' feedback was crucial for developing the next generation of EPCs. The workshops, lasting about two hours, were designed to understand varying critiques and needs among different stakeholders.
Lessons learnt / recommendations for large-scale roll-out:	• EPCs for building energy efficiency comparison, mandatory for property transactions. • Centralise EPC registration, ensure site visits, certify auditors, and offer certifier training. • Streamline calculation parameters, include ecological and energy factors. • Create user-specific EPCs with cost insights and energy-saving advice. • Introduce dynamic EPCs with visual tools and renovation guides.

Policy measures required for large-scale deployment	• Improve EPC communication by intermediaries. • Create user-friendly and technical EPC versions. • Link EPCs to fuel cost databases for dynamism. • Add digital features for real-time EPC updates. • Establish criteria for adequate EPCs and integrate relevant databases.
Evaluation	Evaluation of the stakeholder map was done with an objective-based approach. The final stakeholder map shall present information about the following key aspects: • For what reason stakeholders had contact with the EPC • The importance of the EPC to end users and relevant stakeholders • The end users' individual state of knowledge about the EPC • Perceived connection of the EPC and the energy transition • The information on the EPC which is central to the end users and relevant stakeholders. • The structure and connections of user groups with the EPC.

Status Overview Collection EPCs across MS

Country(s)	Bulgaria, Denmark, Estonia, France, Hungary, Italy, Netherlands, Romania, Slovenia, Spain, Sweden
Source (project info links)	https://u-certproject.eu/ D2.1 Report on implementation of EPC schemes in U-CERT partner countries
Contact details	info@u-certproject.eu
EPBD Recast	Articles EPBD-19, EPBD-3, EPBD-16
Problem/Motivation	EPC programs may exhibit variations in scope, quality, and effectiveness across different countries. By collecting and analysing data on EPC implementation, it becomes possible to assess these variations, benchmark best practices, identify common challenges, and inform policy decisions.
Short description of practice as implemented	The "Status Overview Collection EPCs across MS" involves a systematic collection and analysis of the status of EPCs across various Member States. This practice is intended to gather comprehensive data on the implementation, challenges, and effectiveness of EPC schemes within these countries. By comparing the EPC frameworks and outcomes across different national contexts, U-CERT aims to identify areas for improvement, and opportunities for harmonisation in the realm of building energy performance assessment.
Evidence on impact	• The collection of the EPC reports in the U-CERT countries was coordinated by REHVA (The Federation of European Heating, Ventilation and Air Conditioning) with the support

	of all the relevant project partners responsible for the UCERT case studies for which the EPCs and accompanying annexes were collected and translated to English.
Lessons learnt / recommendations for large-scale roll-out:	• Most analysed EPC case studies did not include explicit cost-effective recommendations for improvement. When included, the information often lacked completeness and understandability for the building owner or prospective owner. • The French EPC case, depicted in the report, utilised user-friendly icons to better illustrate potential improvements. This approach can enhance the understandability of EPCs. • Danish EPCs include contextual information on energy savings proposals, which may facilitate building owners' understanding of the recommendations.
Policy measures required for large-scale deployment	Standardise EP rating methods across countries.
Evaluation	

Analysis of the current EPC Methodologies in 10 countries

Country(s)	Spain, Croatia, Malta, UK, Slovenia, Greece, Poland, Bulgaria, Denmark, Austria
Source	https://www.crosscert.eu/ CrossCERT - D3.1 Review of approaches to EPC assessment across chosen member states, p.32-33
Contact details	David Jenkins: D.P.Jenkins@hw.ac.uk
EPBD Recast	EPBD (16), (40), Article-4,
Problem/Motivation	There is limited comparability of energy performance certificate results between the partner countries. This limited comparability is due to the different methodologies of energy performance certificates, which concern input data, calculation methodology, parameters, default values, lighting and HVAC schedules, verification processes, and others. The motivation behind the activities was to analyse the differences in order to identify potential improvements and harmonized guidelines.
Short description of practice	Review of general aspects and some technical details of EPC assessment methodologies. Different approaches may influence the results of cross-testing as the input parameters and assessment differs.

Evidence on impact	Comparison and analysis of EPC methodologies in 10 countries.
Lessons learnt / recommendations for large-scale roll-out:	There are several approaches observed in the EPC methodologies: Most partner countries' approaches are closer to the standardised with single values or ranges of values provided for each parameter. Bulgaria uses a tailored approach: default values for the inputs are not provided by the methodology, and the assessor uses their experience or actual data collected on site to fill in such inputs. The performance gap (between actual building and calculation results) might be lower, such an approach makes EPC rating comparison between buildings a fundamentally different exercise, where assessors could provide different inputs to the calculation software resulting in different ratings for a given building. Poland and Slovenia use approaches with some inputs tailored to each building and provide the assessor with a higher degree of freedom in terms of the inputs of EPC calculation. Education requirements for EPC assessors: UK and Denmark have less strict conditions compared to other countries; Bulgaria and Croatia have the highest level of education and experience requirements, which is to be expected since the Bulgarian method relies more on the assessor's knowledge and their data collection skills.
Policy measures required for large-scale deployment	The education level and the support/assistance in EPC calculation programs must be coordinated with each other to result in high quality EPCs.
Evaluation of policy measure	

Analysis of existing EPC attitudes and needs

Country(s)	Spain, Croatia, Malta, UK, Slovenia, Greece, Poland, Bulgaria, Denmark, Austria
Source (project info links)	https://www.crosscert.eu/ CrossCERT – Deliverable D5.1 Report on existing EPC attitudes, expectations and needs, p.26-47
Contact details	Domen Bančič, domen.bancic@iri.uni-lj.si
EPBD Recast	Articles EPBD 12, 19, 25, 26, 29
Problem/Motivation	There is a discrepancy between the declared theoretical value of EPCs and the actual experienced and perceived value, which in practice is often reflected in dull descriptions of EPCs, such as them being an administrative necessity.

Short description of practice as implemented	CrossCERT contrasts theory and practice as two largely separate perspectives on understanding existing EPBD policies and EPC schemes.
Evidence on impact	Observations were derived from an initial literature review and largely focus on comparing qualitative insights from the last ten years of EPC assessment and certification practice (Backhaus et al. 2011; Bančič et al. 2021). The proposed crossCert framework largely draws on insights from social sciences and humanities, in particular theories on social objects (Ingold 2012; Nevile et al. 2014; Tateo 2018; Wagner et al. 2018) and social practices (Goffman 1990; Shove et al. 2014; Antczak and Beaudry 2019).
Lessons learnt / recommendations for large-scale roll-out:	• Theoretical assumptions and expectations regarding the impact (or performance) of EPC schemes and EPCs do not match its actual effect on the markets, the people, or society, at least with regard to reflections in lived experiences shared by many relevant stakeholders. Some ambitions projected onto EPCs cannot be realised only by the EPCs as such because of the challenge of diversity in national-level EPBD implementation. Special attention is given to the promotion and marketing of EPC products and services, design and user experience, and training of accredited EPC assessors. • Buildings should not be considered only as structured physical materials but also as complex (assemblages) of social objects and meanings. EPB policy must consider the aspects of ethics and social justice, particularly if the policymakers wish to label it as people-centred. Recommendations include better stakeholder engagement, improving EPC design to make it more accessible and understandable for the public, enhancing the training of assessors, and refining the marketing and communication strategies to foster trust and reduce reluctance. It advocates for addressing the needs of diverse user groups while aligning policies with real-world experiences. The focus is on improving how EPCs are perceived and used by individuals, integrating their feedback into the design process.
Policy measures required for large-scale deployment	Develop a user-centric EPC framework Engage key stakeholders (fostering collaboration between policymakers, energy assessors, building owners, tenants to ensure, EPCs align with real-world needs and expectiations) Define key actors and EPC process mapping (creating detailed overviews of stakeholders and their interactions in the EPC process to identify optimization opportunities) Actively engage end-users in development Adapt EPCs to diverse user needs Improve communication and marketing of EPCs

	Ensure clarity and accessibility (use simple language and visual tools to make EPC information easily understandable for non-experts) Increasing public awareness on the importance of energy efficiency and the role of EPCs Using the concept of buildings as little social universes and EPCs as social objects Strengthen training and certification for EPC assessors Developing standardized training programs Provide and request regular training to keep assessors updated on new energy efficiency regulations and best practices Enhance digitalization and data integration Establish online portals to facilitate access to PC data Leverage smart technologies
Evaluation	

Inventory of similar EU projects

Country(s)	Spain, Croatia, Malta, UK, Slovenia, Greece, Poland, Bulgaria, Denmark, Austria
Source (project info links)	https://www.crosscert.eu/fileadmin/user_upload/crossCert_D2.3_Recent_EPC_initiatives_across_Europe_3rd_version__delivered_.pdf
Contact details	Elena Taxeri: elena@cres.gr
EPB Recast	Articles EPBD-12, 15, 16, 19, 22,
Problem/Motivation	Existing EPC frameworks have limitations, and there is a need to enhance them to address broader concepts like building renovation roadmaps and support for local authorities. Several EU-funded initiatives aim to resolve these issues, focusing on EPC improvements, methodologies, and new approaches. The goal was to capitalize on lessons learned from previous projects to facilitate the convergence of EPCs and ensure consistency in their application across Europe.
Short description of practice as implemented	crossCert partners asesssed previous projects in respect of lessons learned, EPC developments and new EPC approaches. In that way, the previous work that was funded by the European Union was capitalised and each crossCert partner had yeast to start processing the EPCs convergence issues. This European project review has been performed in 3 rounds throughout crossCert lifetime to include all new approaches and developments that were tested in the cross-assessment rounds within other tasks of the project.

	In particular, the document retrieves the information from projects that have proposed new approaches, from projects that have worked with new Key Performance Indicators (e.g. SRI) or have tested new software for the energy assessment of buildings. Finally, the document includes sections that refer to the human factor (training, marketing and the improved relation between EPCs and the building owners). It contains also a brief description of each project as well as contact details.
Evidence on impact	Review of 30 EU related projects and mapping them according to project's priorities.
Lessons learnt / recommendations for large-scale roll-out:	Seven projects have dealt directly with the EPC approach. • Twenty-six projects are valuable in terms of their research and recommendations on policy, human behaviour, financing and investments and exploitation of broader concepts like SEAPS, one-stop-shop, Energy Performance Contracting, Building Renovation Passport, Digital logbooks, Smart reediness indicator but also Real Estate. Nine projects analysed the current calculation methods and data set of the EPCs and have identified deficiencies as well as the potential for improvements. • Thirteen projects have also proposed Key Performance Indicators on energy, environment, indoor quality, and access to funding, Twelve projects have developed software, not necessarily for issuing EPCs but also platforms and tools that are comparing EPCs or using their data or connect them with databases or simplify them for the general public or local authorities. Conclusion: Building Renovation Roadmaps: These tools provide step-by-step guides for building renovation, but they are often not integrated into EPCs fully and can be difficult for users to implement without expert help. Energy and Financial Assessment Tools: These are helpful for determining the feasibility of energy-saving projects but can be complex and require expertise to interpret results, making them less accessible to the general public. One-Stop-Shops: These platforms are designed to offer integrated advice and services for building renovation, but they struggle to reach a wide audience due to visibility issues and lack of local adaptation. Public Sector Support Tools: These tools are designed to help local authorities with energy assessments and renovations in public buildings, but they require deeper local engagement and resources to achieve broader impact.

Policy measures required for large-scale deployment	Some of the projects include policy recommendations Harmonization of methodologies to a certain degree: The recommendation is to create standardized EPC frameworks and metrics across EU countries to avoid confusion and inefficiencies, promoting common ground in EPC calculations and classifications. User-Centered Design: Next-gen EPCs should include features like user-friendly interfaces, dynamic renovation roadmaps, and energy efficiency indicators that cater to diverse user needs, facilitating better engagement with the system. Support for Local Authorities: Projects suggest offering training, tools, and resources to local governments, enabling them to assess and improve energy efficiency in public buildings, including financial support and advice on technical renovations. Cross-Border Collaboration: Encouraging EU projects to share insights and successful strategies to improve EPCs, facilitating peer learning and enhancing the overall consistency and application across regions Fostering the integration of digital technologies in EPC systems Use of smart-meter-data
Evaluation	

Analysis of available KPIs and scales from Horizon2020 projects and partner countries

Country(s)	Spain, Croatia, Malta, UK, Slovenia, Greece, Poland, Bulgaria, Denmark, Austria
Source (project info links)	CrossCert_D3.3_Analysis_of_new_scales_and_KPIs.pdf
Contact details	Karolina Junak: kjunak@kape.gov.pl
EPBD Recast	Articles EPBD-6, 7, 22
Problem/Motivation	Traditional EPCs have primarily focused on basic energy consumption metrics, which may not fully capture a building's overall performance or its integration of modern smart technologies. With the introduction of concepts like the Smart Readiness Indicator (SRI) in European directives, there's a recognized need to incorporate additional dimensions into EPC assessments. These include smartness, human-centric factors, financial considerations, and climate change impacts.
Short description of practice as implemented	D3.3 takes existing EPC approaches of member states, alongside Horizon2020 projects, and propose a series of appropriate output metrics and KPIs that are deemed achievable from those methods (where some of these metrics may already be used by those methodologies). This mapping of appropriate output metrics with

	assessment type will then be used to highlight which type of approach is suitable for meeting “new” requirements of EPCs, and the degree to which such assessment approaches may be harmonised across member states. In detail: The report outlines the implementation of new scales and Key Performance Indicators (KPIs) to enhance Energy Performance Certificates (EPCs). Practices include: • Expanding EPC metrics beyond basic energy consumption to integrate smart readiness, financial viability, and climate impact. • Testing and validating new KPIs through case studies and pilot projects across different building types and regions. • Aligning with EU directives, such as the Smart Readiness Indicator (SRI), to ensure harmonization with regulatory frameworks. • Developing improved rating scales that offer a more detailed and accurate reflection of building performance.
Evidence on impact	Review of EU related projects and partner’s EPCs mapping them according to five categories.
Lessons learnt / recommendations for large-scale roll-out:	The predominant focus of these projects lies in the refinement and adaptation of existing Key Performance Indicators (KPIs) through conducted research and surveys. Primarily, considerable attention is directed towards KPIs related to the smartness and energy efficiency of buildings. In countries, the most popular indicators are the KPIs from the "life cycle" category, the second most popular category is the indicators from the "climate change" category. - each of them related to CO2 emissions. The third most popular were financial KPIs. "Smartness" and "human-centric" indicators were missing from the front page
Policy measures required for large-scale deployment	• Incorporate comprehensive KPIs: expanding EPCs to include KPIs that address smartness, human-centric factors, financial metrics, and climate change impacts provides a holistic view of building performance. This comprehensive approach ensures that EPCs remain relevant and informative for stakeholders. • Standardize Assessment Methods Across Member States: Harmonizing EPC assessment methodologies facilitates comparability and consistency across the EU. Standardization reduces complexity and fosters mutual recognition of certifications, promoting a unified market for energy-efficient buildings. • Leverage Digital Technologies: Integrating digital tools, such as centralized databases and smart metering systems,

	enhances the accuracy and accessibility of EPC data. Digitalization streamlines the certification process and supports real-time monitoring of building performance. • Engage Stakeholders Through Clear Communication: Developing user-friendly EPC formats and conducting public awareness campaigns can improve understanding and acceptance among building owners, tenants, and industry professionals. Effective communication ensures that stakeholders are informed and motivated to participate in energy efficiency initiatives. • Provide Training and Certification for Assessors: Implementing standardized training programs ensures that EPC assessors possess the necessary skills and knowledge. Continuous professional development maintains high-quality assessments and adapts to evolving industry standards.
Evaluation	

Harmonised verification framework for quality checking EPC outputs

Country(s)	Spain, Croatia, Malta, UK, Slovenia, Greece, Poland, Bulgaria, Denmark, Austria
Source (project info links)	crossCert_D3.6_Proposed_harmonised_verification_framework_for_quality_checking_EPC_v3__delivered_.pdf
Contact details	Mahsa Sayfikar: m.sayfikar@hw.ac.uk
EPBD Recast	EPBD Art. 19, 27, Annex VI
Problem/Motivation	The report titled "Proposed Harmonised Verification Framework for Quality Checking EPC Outputs" addresses the significant variations in EEPC assessment methodologies across European countries. These differences encompass calculation methods, software tools, document formats, and assessor qualifications, leading to inconsistencies in EPC quality. The motivation behind this report is to propose a standardized framework for quality control in EPC assessments, aiming to harmonize practices across Europe and enhance the reliability and comparability of EPC
Short description of practice as implemented	The authors suggest the implementation of a standardized quality verification framework for Energy Performance Certificates (EPCs). This framework includes guidelines for consistent quality checks across EU Member States, ensuring that EPC assessments meet uniform standards. Practices outlined in the report involve:

	• Developing harmonized verification methods for EPC data and outputs. • Implementing uniform quality control processes to ensure consistency and reliability in EPC results. • Standardizing tools and procedures used for EPC assessments across different countries to promote comparability and reduce discrepancies.
Evidence on impact	The report "Proposed Harmonised Verification Framework for Quality Checking EPC Outputs" does not provide specific quantitative evidence on the impact of implementing the proposed quality control framework. Instead, it offers a comprehensive analysis of existing quality control mechanisms across various European countries, highlighting differences and best practices. While the report does not present empirical data on the impact of such standardization, it emphasizes the importance of harmonizing quality control measures to improve the effectiveness of EPCs across Europe.
Lessons learnt / recommendations for large-scale roll-out:	Variations in assessment practices across EU Member States can lead to discrepancies in EPC quality. The implementation of quality control systems requires cooperation between policymakers, industry experts, and regulatory bodies. A variety of software tools and assessment methods are currently in use, leading to inefficiencies. Continuous monitoring and improvement - Quality control frameworks need to adapt to evolving technologies and energy efficiency standards. Inconsistent qualifications and training for EPC assessors can affect the quality of EPCs.
Policy measures required for large-scale deployment	Establish uniform quality checking procedures for EPCs across all Member States to ensure consistency and reliability in their results. Facilitate stakeholder collaboration to define and adopt best practices in quality verification, ensuring broad acceptance and alignment with EU objectives. Create centralized digital platforms and standardized tools to support the quality verification of EPCs, making the process more efficient and accessible. Implement a system of continuous monitoring and periodic updates to the quality verification framework, ensuring it stays aligned with technological advancements and regulatory changes. Introduce standardized training and certification programs for assessors to ensure they possess the necessary expertise to conduct high-quality assessments.
Evaluation	

Linking next-generation of EPCs to energy audits, logbooks and BRPs

Country(s)	Spain, Croatia, Malta, UK, Slovenia, Greece, Poland, Bulgaria, Denmark, Austria
Source (project info links)	crossCert_D4.4_Linking_next_generation_EPC_to_energy_audits_logbooks_BRPs.pdf
Contact details	Nicole Hartl: nicole.hartl@energyagency.at
EPBD Recast	Articles EPBD-12, 16, 22
Problem/Motivation	The report titled "Linking Next-Generation EPCs to Energy Audits, Logbooks, and BRPs" addresses the need for accessible and reliable information on building energy efficiency and renovation measures. The motivation behind this report is to enhance energy management in buildings by integrating next-generation Energy Performance Certificates (EPCs) with energy audits, Building Renovation Passports (BRPs), and logbooks. This integration aims to provide a more nuanced understanding of building energy performance, facilitate continuous monitoring, and ensure targeted renovation measures, thereby fostering proactive energy management.
Short description of practice as implemented	The report outlines the integration of next-generation EPCs with energy audits, logbooks, and BRPs. The proposed practices involve: • Linking EPCs with energy audits to provide a comprehensive view of building energy performance and potential areas for improvement. • Connecting EPCs with BRPs to guide owners through energy-efficient renovation paths and track long-term improvements. • Utilizing digital logbooks to store and update information about building energy usage, maintenance, and renovation, facilitating better decision-making for energy efficiency.
Evidence on impact	The report does not provide specific quantitative evidence of impact, but it outlines several key recommendations aimed at linking EPCs with different digital tools and thus improving energy efficiency and promoting sustainable building practices.
Lessons learnt / recommendations for large-scale roll-out:	• Successful integration requires strong cooperation between building owners, energy auditors, policymakers, and technology providers. • Digital tools, such as online platforms for EPCs, energy audits, and logbooks, are crucial for efficient data management and access. • Static data can quickly become outdated, reducing the effectiveness of energy performance assessments.

	• Generic energy-saving measures may not be effective for all buildings. • Stakeholders such as EPC assessors, building owners, and energy auditors require proper training to utilize the new systems effectively. • A lack of clarity in regulatory standards can create barriers to adoption. • Fragmented data can hinder effective decision-making.
Policy measures required for large-scale deployment	• Promote cross-sector collaboration to align efforts and ensure the availability of comprehensive and actionable data for all parties involved. • Invest in digital infrastructure and create user-friendly, accessible platforms to facilitate real-time updates and data sharing across systems. • Implement dynamic EPCs and systems that are updated regularly with real-time performance data to provide accurate, current information. • Provide personalized, context-specific recommendations based on energy audits and performance data to support targeted energy efficiency measures. • Establish training programs and certification standards for professionals involved in energy audits and EPC assessments to maintain high-quality outputs. • Develop consistent regulations and clear guidelines that align with EU energy efficiency goals and support the adoption of integrated systems. • Create data-sharing mechanisms that allow stakeholders to access relevant building performance data, enhancing transparency and collaboration.
Evaluation	

CrossCert Infographics

Country(s)	Spain, Croatia, Malta, UK, Slovenia, Greece, Poland, Bulgaria, Denmark, Austria
Source (project info links)	crossCERT: Infographics Overview
Contact details	Domen Bančič, domen.bancic@iri.uni-lj.si
EPBD Recast	Articles EPBD-16, 18, 19, 25
Problem/Motivation	The infographics developed by the crossCert project were motivated by the need to enhance understanding and engagement

	with Energy Performance Certificates (EPCs) among various stakeholders.
Short description of practice as implemented	The visual tools developed aim to demystify the EPC process, clarify the roles of assessors, and highlight the importance of effective promotion and marketing strategies. By presenting complex information in an accessible and user-friendly format, the infographics seek to foster greater awareness and participation in energy efficiency initiatives across Europe.
Evidence on impact	Work within crossCert, crossCert D5.1
Lessons learnt / recommendations for large-scale roll-out:	The following infographics were produced with the recommendations to use them in communication processes with various stakeholders like EPC assessors, decision/policy makers training providers, home owners, communicators etc.: • The people-centred view • The EPC design journey • The assessors view • EPC promotion and marketing
Policy measures required for large-scale deployment	Using the infographics in processes with EPC assessors, decision/policy makers training providers, home owners, communicators et
Evaluation	

Integration of a new set of indicators (SRI Method B, among others) into NG EPCs using the D^2EPC web platform

Country(s)	Austria, Cyprus, Greece, Germany, Lithuania, Netherlands, Spain
Source (project info links)	D^2EPC
Contact details	Panagiota Chatzipanagiotidou: phatzip@iti.gr
EPBD Recast	Articles EPBD-19, EPBD-14, EPBD-15, EPBD-16, EPBD-27
Problem/Motivation	Traditional EPCs focus primarily on energy efficiency but do not fully account for a building's overall environmental impact throughout its lifecycle. This gap can lead to underestimation of a building's carbon footprint and overlooks the broader sustainability aspects.
Short description of practice as implemented	The D^2EPC methodology includes a novel set of indicators into EPC assessment, namely the Smart Readiness Indicator (SRI), human comfort and wellbeing indicators, energy and environmental indicators and financial indicators. It aims to raise awareness of the benefits of smart technologies and ICT in

	buildings, to consider the whole life cycle of the building as a structure, to focus also on the "human-centric" nature of the next generation EPC and to increase the user-friendliness of the EPC by using terms that are widely understood and accepted by the public, such as the monetary indicators related to the main energy consumptions of the building(heating, cooling, lighting, appliances). The D^2EPC web platform and additional services comprise an intuitive user interface, where developed functionalities are accessible by end users. It serves as a common user-friendly interactive environment for accessing all the D^2EPC tools. It hosts the presentation of all the results from the different components and sub-components, such as the EPCs, the KPIs, and the additional services. Through the web platform, end users (engineers, building owners, registries, etc.) can not only customise and configure certain components by all the necessary data through the user interface after uploading the building's IFC file (BIM), but also request directly the execution of certain processes. An asset or operational rating-based EPC can be issued; a road-mapping-tool, an AI performance forecasts module along with performance alerts and notifications is available; and a Building Energy Performance Benchmarking tool provides a ranking, based on the user role, of buildings that have been assessed using the web platform. In order to ensure adequate data quality, a data verification process is applied to all data collected by the Energy Performance Verification and Credibility Tool from metering/sensing infrastructure. The D^2EPC prototype also provides a WebGIS tool.
Evidence on impact	Testing and validation of the D^2EPC prototype on 6 pilot sites.
Lessons learnt / recommendations for large-scale roll-out:	• Collection of real energy consumption data into a dynamic EPC. • EPC must provide easy to understand information, including measured data and other information such as indoor air quality and financial aspects. • SRI should be integrated in the EPC to harmonise the EPCs with the smart city concept • The use of advanced digital construction design tools (6D Level 3 BIM) could improve the effectiveness of certificates. • EPC data quality is linked to level of detail and quality of input data. • The EPC calculation should be combined with the building energy performance simulation for the design of the HVAC equipment and the thermal comfort of the building. • Regular training of energy consultants and assessor is required to deliver the EPC and a high-quality energy assessment of the building.

	• Novel indicators could be divided into building shell and building technical system-oriented indicators. • Operational rating calculation should be harmonised accross Europe.
Policy measures required for large-scale deployment	• Need for monitoring equipment for real time collection and for enforcement of national regulations • Information about operational rating should be provided periodically to end-users through a dedicated platform. • Visualisation of EPCs in a GIS environment toprovide a comprehensive view of the actual performance of buildings, facilitating efficient energy planning. • Use of a digital comprehensive and transparent platform for building energy performance assessment. • The provision of BIM documentation and digital logbooks can improve the data quality. • Establishment of standardisation working groups in the field of operational rating.
Evaluation	A questionnaire was developed for the experts of the participating countries in order to get an overview on the following issues: i) Smart Readiness Indicators; ii) Use of EPCs beyond provision at the point of sale, rental or construction; iii) Methods to verify the application of renovation measures; iv) Use of digital models, use of EPC databases; v) Training of EPC issuers; vi) Use of smart meters and finally; vii) Market acceptance of EPCs.

Recommendations for harmonisation process

Country(s)	France, Germany, Spain, Italy, Slovakia, Luxembourg
Source (project info links)	https://epc-recast.eu/
Contact details	Rofaïda Lahrech rofaida.lahrech@cstb.fr
EPBD Recast	Articles EPBD-19, EPBD-3, EPBD-4
Problem/Motivation	The motivation behind this practice is to harmonise the 28+ different approaches to EPC across the EU and improve their comparability. This is driven by the need for standardisation in assessing building energy performance.
Short description of practice as implemented	The "Recommendation for Harmonisation Process" practice involves advocating for the standardisation and harmonisation of EPC methodologies across the European Union. This includes incorporating international standards, smart building technologies, and data sets into a cohesive approach to ensure EPC comparability over the EU.
Evidence on impact	

Lessons learnt / recommendations for large-scale roll-out:	
Policy measures required for large-scale deployment	
Evaluation	

Indicator Development for EPC Contextual Analysis

Country(s)	France, Germany, Spain, Italy, Slovakia, Luxembourg
Source (project info links)	https://epc-recast.eu/
Contact details	Rofaïda Lahrech rofaida.lahrech@cstb.fr
LATER: EPBD Recast	Articles EPBD-19, EPBD-3
Problem/Motivation	The practice is motivated by the need to improve the assessment of building energy performance within different national contexts in the EU. It aims to address the variability and challenges encountered in implementing EPC across diverse regulatory and building environments.
Short description of practice as implemented	The practice involves creating indicators that can effectively assess the implementation and performance of EPCs within various national contexts in the EU. These indicators are designed to capture both the challenges and successes encountered during EPC implementation.
Evidence on impact	
Lessons learnt / recommendations for large-scale roll-out:	
Policy measures required for large-scale deployment	
Evaluation	Six representative pilot buildings have been identified and selected to verify the approach in general and, in particular, the sensors' applicability and communication, the data reliability, and the monitoring platform. Currently, the EPC Recast's overall methodology and the technologies to enhance the features and assessment of the new generation of EPC is under a final tuning stage, then will be test as a complementary action of the long-term monitoring on the pilot buildings around Europe to evaluate and validate the overall proposed approach.

Identification of Gaps in Current Sustainability Frameworks

Country(s)	EU countries, South Africa, China, Hong Kong (China), India, Mexico, Germany, USA
Source (project info links)	https://www.smartlivingepc.eu/en/ D2.1 Asset methodology assessment in building level D2.2 Asset assessment methodology in complex level
Contact details	Dr. Dimosthenis Ioannidis - djoannid@iti.gr
EPBD Recast	Articles EPBD-7, EPBD-19
Problem/Motivation	The lack of specific metrics and indicators directly linked to energy consumption in sustainability frameworks.
Short description of practice as implemented	The practice involves examining existing urban sustainability frameworks and identifying the absence of specific energy consumption metrics.
Evidence on impact	
Lessons learnt / recommendations for large-scale roll-out:	Urban sustainability frameworks are organised into three dimensions: environmental, economic, and social, with an additional institutional dimension. It was observed that the institutional dimension of sustainability was inadequately represented. The neighbourhood sustainability assessment tools also demonstrated an underrepresentation of the social and institutional dimensions. The analysis further indicated that infrastructure for circulation and street lighting, followed by urban forests and drinking water provision, were the most prominent energy-consuming services..
Policy measures required for large-scale deployment	Development and integration of standardised energy efficiency metrics.
Evaluation	Extensive review of existing frameworks, tools, and standards. Building upon this work, collaborative discussions were held with project partners to determine the most appropriate criteria for delimiting the energy performance evaluation areas.

Development and Implementation of an Energy-Efficient Building Renovation Planner

Country(s)	Denmark, Ireland, Spain, Greece, Switzerland
Source (project info links)	https://www.chronicle-project.eu/
Contact details	Leon Nielsen – Project Manager lnielsen@fcire.es
EPBD Recast	Articles EPBD-12, EPBD-3, EPBD-18, EPBD-19, EPBD-9, EPBD-13

Problem/Motivation	Challenges such as suboptimal energy efficiency in buildings, the complexity of renovation planning, financial considerations, tenant comfort, and sustainability concerns.
Short description of practice as implemented	The Renovation Planner is a tool designed for building professionals and homeowners to plan energy-efficient building renovations. It assesses various renovation scenarios, offering complete financial evaluations and considering factors like tenant comfort and carbon emissions. Users can prioritise preferences, and the tool provides a list of recommended scenarios. Each scenario includes a detailed renovation roadmap. After selecting a preferred scenario, the Renovation Planner issues a building renovation passport (BRP) containing proactive information about future inspections, maintenance, and renovations based on expected component and material service life.
Evidence on impact	
Lessons learnt / recommendations for large-scale roll-out:	
Policy measures required for large-scale deployment	
Evaluation	

Development of an Investment Appraiser for Building Performance and Energy Saving Investments

Country(s)	Denmark, Ireland, Spain, Greece, Switzerland
Source (project info links)	https://www.chronicle-project.eu/
Contact details	Leon Nielsen – Project Manager lnielsen@fcire.es
EPBD Recast	Articles EPBD-7, EPBD-12, EPBD-17, EPBD-19
Problem/Motivation	Building professionals and stakeholders often lack a comprehensive tool for assessing the true value and long-term costs of building performance, including both financial and environmental aspects. There is a growing need for informed decision-making when it comes to energy-saving investments and building valuations. Without a robust tool, stakeholders may struggle to evaluate the full financial and environmental implications of their choices.
Short description of practice as implemented	The Investment Appraiser is a tool developed to address challenges in the building industry by providing a comprehensive solution for assessing building value, life cycle costs, and carbon impact. Its primary functions include performing Life Cycle Cost (LCC)

	analyses, encompassing dynamic and static costs, and calculating the Carbon Bill for both baseline and renovation scenarios. This tool empowers stakeholders with the information needed to make informed decisions regarding building performance, energy-saving investments, and environmental impact, contributing to more sustainable and financially sound choices in the AEC industry.
Evidence on impact	
Lessons learnt / recommendations for large-scale roll-out:	
Policy measures required for large-scale deployment	
Evaluation	

Development of apps for both residents (ChroViewOcc) and professionals (ChroViewPlus) to understand and improve energy consumption

Country(s)	Denmark, Ireland, Spain, Greece, Switzerland
Source (project info links)	https://www.chronicle-project.eu/
Contact details	Leon Nielsen – Project Manager lnielsen@fcire.es
EPBD Recast	Articles EPBD-19, EPBD-29
Problem/Motivation	The motivation for this practice is to enable residents and professionals to better understand and manage energy consumption in buildings, contributing to increased energy efficiency and reduced carbon footprint.
Short description of practice as implemented	ChroViewOcc is an app designed for building residents to monitor and improve their energy consumption, providing insights into current energy performance and actionable suggestions for energy efficiency improvements. ChroViewPlus is targeted at professionals like Energy Service Companies (ESCOs) and Facility Managers (FM), offering expert recommendations and in-depth insights to effectively reduce energy consumption and costs.
Evidence on impact	
Lessons learnt / recommendations for large-scale roll-out:	
Policy measures required for large-scale deployment	

Evaluation	

Development of EMPOWER (Energy Monitoring POrtal for aWare usERs) to monitor energy consumption and improve the awareness of users

Country(s)	Italy
Source	https://www2.enea.it/it/ricerca-di-sistema-elettrico/accordo-di-programma-MiSE-ENEA-2019-2021/tecnologie/efficienza-energetica-e-risparmio-di-energia-negli-usi-finali-elettrici-degli-edifici
Contact details	biagio.dipietra@enea.it
EPBD Recast	Articles EPBD-29, EPBD-19
Problem/Motivation	• Energy consumption of Italian residential building stock accounts for around 43% of the national energy requirements, most of which concerns space heating (i.e., approximatively 70%) based on fossil fuels. • Improving awareness of final users on their energy consumptions, enabling them to better manage energy use, save energy and lower their bill. • EU Directive 2018/2002, transposed into Legislative Decree 73/2020, mandates more frequent information provision to end-users about their consumption.
Short description of practice	EMPOWER is a web portal devoted to visualise energy consumption data collected from smart meters installed in buildings with centralised heating systems. EMPOWER displays simplified energy indices of apartments by comparing the actual energy consumption with: • the expected heating demand of the apartment (preliminary calculated); • the average of the condominium apartments.
Evidence on impact	Users that frequently access to EMPOWER are encouraged to modify their behaviours.
Lessons learnt / recommendations for large-scale roll-out:	Adaptation of companies and installers to new obligations and, consequently, market uptake of smart metering and communication technology.
Policy measures required for large-scale deployment	According to Legislative Decree 73/2020, starting from January 1, 2027, remote reading of individual heat meters and allocators will be mandatory.
Evaluation of policy measure	n.a.

3 Upgrading EPC

3.1 Summary – to follow

3.2 Practices

Enhancing EPCs by incorporating Building Renovation Passport (BRP)

Country(s)	Bulgaria, Greece, Poland, Portugal, Romania and Spain
Source (project info links)	https://ibroad2epc.eu/# iBRoad2EPC in depth
Contact details	contact@ibroad2epc.eu
EPBD Recast	Articles EPBD-8, EPBD-12, EPBD-19
Problem/Motivation	The gap in current EPCs which often lack comprehensive, long-term renovation strategies aligned with national climate targets. Often, EPCs do not include concrete technical renovation recommendations, are selected automatically, describe only few measures with insufficient information, and have no strict relation to the national strategies for the building stock.
Short description of practice as implemented	This approach enhances EPCs by integrating long-term, step-by-step renovation strategies tailored to individual buildings. These strategies are aligned with national climate and energy targets, providing a detailed, forward-looking plan that surpasses the traditional EPC format, which typically offers only a static snapshot of a building's energy performance.
Evidence on impact	The project aims to test and evaluate the applicability of the iBRoad2EPC concept in six countries.
Lessons learnt / recommendations for large-scale roll-out:	
Policy measures required for large-scale deployment	
Evaluation	

Standardised Procedure for EPC Enhancement with Specialist Input

Country(s)	Bulgaria, Greece, Portugal, Spain, Romania
Source (project info links)	https://ibroad2epc.eu/# Conceptualising iBRoad2EPC
Contact details	contact@ibroad2epc.eu

EPBD Recast	Articles EPBD-12, EPBD-13, EPBD-19, EPBD-25, EPBD-27
Problem/Motivation	The practice was developed to address the limitations of existing EPCs in accurately reflecting the unique energy performance characteristics of individual buildings. It seeks to improve the precision and relevance of EPCs by incorporating the expertise of specialists.
Short description of practice as implemented	This practice involves a standardised procedure where specialists conduct on-site visits to evaluate buildings. They then determine the most appropriate renovation measures, their sequence, and their alignment with national GHG targets. The practice emphasises individualised strategies for each building, considering its specific characteristics and future legal obligations.
Evidence on impact	The project aims to test and evaluate the applicability of the iBRoad2EPC concept in six countries.
Lessons learnt / recommendations for large-scale roll-out:	
Policy measures required for large-scale deployment	
Evaluation	

iBRoad2EPC Assistant Tool for Enhanced EPCs

Country(s)	Bulgaria, Greece, Romania, Poland, Portugal, Spain
Source (project info links)	https://ibroad2epc.eu/# Conceptualising iBRoad2EPC
Contact details	contact@ibroad2epc.eu
EPBD Recast	Articles EPBD-12, EPBD-19
Problem/Motivation	Need to streamline the process of integrating Building Renovation Passport elements into existing EPCs, ensuring uniformity in design, ease of use for issuers, and adaptability to various platforms.
Short description of practice as implemented	The iBRoad2EPC Assistant Tool is an online backend tool designed to create iBRoad2EPCs in a uniform format. It allows for the output of iBRoad2EPC in both online and printable versions, provides user-friendly guidance for issuers, facilitates the assignment of renovation measures at specific times, and allows for easy modification of default content. The tool is designed for compatibility with various platforms, including existing EPC software and energy performance registers in Member States.

Evidence on impact	The project aims to test and evaluate the applicability of the iBRoad2EPC concept in six countries.
Lessons learnt / recommendations for large-scale roll-out:	
Policy measures required for large-scale deployment	
Evaluation	

iBRoad2EPC Additional Modules for Enhanced EPCs

Country(s)	Bulgaria, Greece, Romania, Poland, Portugal, Spain
Source (project info links)	https://ibroad2epc.eu/# iBRoad2EPC in depth
Contact details	contact@ibroad2epc.eu
EPBD Recast	Articles EPBD-19, EPBD-16, EPBD-12
Problem/Motivation	The need for a comprehensive tool that meets the needs of the market, the possibility of introducing BRP elements in the EPC, and opportunities for further development.
Short description of practice as implemented	The iBRoad2EPC Basic Module comprises all core features of iBRoad2EPC. In addition to the Basic Module it is possible to add special features to the iBRoad2EPC individually. This will allow an upgrade to the iBRoad2EPC that is tailored to the specific country's needs. When implementing iBRoad2EPC, countries can decide whether and which additional features they want to integrate, so that iBRoad2EPC fits well into the existing consulting landscape or with other existing policy instruments in the buildings sector. Additional modules possible: • Cost Module • Energy Demand Module • Indoor Environmental Quality (IEQ) Module • Smart Readiness Indicator (SRI) Module • Other
Evidence on impact	The project aims to test and evaluate the applicability of the iBRoad2EPC concept in six countries.
Lessons learnt / recommendations for large-scale roll-out:	

Policy measures required for large-scale deployment	
Evaluation	

Using Building Information Modelling (BIM) for the EPC generation process

Country(s)	Austria, Croatia, Cyprus, Italy, Slovenia, and Spain
Source (project info links)	https://timepac.eu/ D2.1 Generating enhanced EPCs with BIM data Transversal Deployment Scenario 1
Contact details	Leandro Madrazo Agudin – Project Coordinator leandro.madrazo@salle.url.edu
EPBD Recast	Articles EPBD-19, EPBD-8, EPBD-16, EPBD-22
Problem/Motivation	EPCs may not reflect a building's actual energy performance due to outdated or incomplete data and lack of standardisation. Varying methods, tools, and experts used for assessment can lead to inaccurate input data.
Short description of practice as implemented	BIM is a digital representation of a building's physical and functional characteristics. It supports design, construction, operation, and maintenance. BIM models provide accurate data on geometry, materials, systems, and performance, used to calculate EPCs. Using BIM reduces human errors, improving the reliability and efficiency of energy needs assessment.
Evidence on impact	Case studies in six countries: a total of 30 buildings, with five buildings from each country, were modelled following the guidelines. These buildings varied significantly in terms of their design, type, and purpose providing a diverse set of models for examination.
Lessons learnt / recommendations for large-scale roll-out:	• Creating a BIM just for an EPC may not be worth it due to the time required. BIM in a BRP is justified. • Use open standards and protocols that enable different software applications and systems to exchange data seamlessly. • For a model to be optimally developed, exported, verified, and imported, it should avoid any lack of information, particularly when different individuals are responsible for each of the processes. • To assess the reliability of a BIM model, a comprehensive comparison should be conducted between the model and actual building data.

	• Improve data interoperability between BIM and EPC software, ensuring smoother and more accurate energy performance assessments.
Policy measures required for large-scale deployment	• Government and regulatory bodies can influence standards adoption through project requirements and codes.
Evaluation	

Integrated District Energy Assessment for EPCs

Country(s)	Denmark, Italy, Poland, Romania
Source (project info links)	https://x-tendo.eu/ X-tendo feature 5: district energy p. 9-17
Contact details	Lukas Kranzl – Project Coordinator Lukas.Kranzl@tuwien.ac.at
EPBD Recast	Articles EPBD-8, EPBD-16, EPBD-12, EPBD-19
Problem/Motivation	The temperature demanded for comfortable spaces during the heating season usually lies in the range of 18 to 22°C. However, heat supply and distribution systems installed in many buildings operate at supply temperatures well above these required temperatures. Decreasing the supply and distribution temperatures for space heating systems in buildings would allow for higher efficiency in the heat supply and for using low-temperature heat sources like solar thermal or waste heat via district heating (DH) networks. At the same time, many DH systems still use very significant amounts of fossil fuel for heat generation and need to be decarbonised.
Short description of practice as implemented	The "Integrated District Energy Assessment for EPCs" practice evaluates the energy efficiency and environmental impact of a district heating (DH) or cooling network near a building. It assesses the DH network's efficiency, carbon content, and renewable energy share, as well as the building's suitability for low-temperature heat supply. The assessment aids residents in understanding the network's performance and potential connection to a low-temperature DH system, promoting energy efficiency and decarbonisation in heating.
Evidence on impact	In-building tests in three countries: Romania, Italy, Poland using the calculation tool. To use the calculation tool, additional data, with respect to those currently collected for the usual EPC issuing process in the different countries was collected during the on-site visit, and additional calculations (i.e., the heat load of the representative room) were performed.

Lessons learnt / recommendations for large-scale roll-out:	Essential to offer estimation tables for various radiator and heat transfer system types with thermal output at different temperatures, aiding EPC assessors.
Policy measures required for large-scale deployment	• For the implementation of this feature there must be provisions in place to set up two databases with DH parameters and parameters of the radiators at national level. • It is important to show the economic feasibility of district heating, to involve the public in urban planning, engage people in finding solutions and planning district heating.
Evaluation	Estimation of the quantitative replicability potential.

Comprehensive Indoor Comfort Assessment in EPCs

Country(s)	Austria, Greece, Portugal, Romania
Source (project info links)	https://x-tendo.eu/ X-tendo feature 2: comfort indicator p. 9-17
Contact details	Lukas Kranzl – Project Coordinator - Lukas.Kranzl@tuwien.ac.at
EPBD Recast	Articles EPBD-19, EPBD-4, EPBD-29
Problem/motivation	Currently no assessment of the comfort levels of a building is being conducted and therefore recommended renovation measures might ignore the potential of improving or adverse effects on comfort.
Short description of practice as implemented	The "Comprehensive Indoor Comfort Assessment in EPCs" enriches EPCs by evaluating indoor air quality, thermal comfort, and acoustic comfort. It informs building owners and occupants about the quality of their indoor environment, offering guidance on optimising heating, cooling, ventilation, and noise levels for a more comfortable and energy-efficient living or working space.
Evidence on impact	Tested in four countries (Romania, Portugal, Greece, Austria) through in-building testing on various building types, including single-family houses, multi-family houses, offices, and schools. The testing aimed to assess user comfort by quantifying thermal, indoor air, visual, and acoustic comfort on a scale of 1-10, with an overall comfort rating.
Lessons learnt / recommendations for large-scale roll-out:	• The comfort feature methodology is adaptable for different building typologies. • CORP tool is more rigorous, while CARP is faster and effective for onsite assessment. • Overheating is an important issue in MS for which both the methodologies CORP and CARP have been designed to evaluate. • The comfort feature is designed to fill the awareness gap about healthy and comfortable homes.

	• There is a very high interest from homeowners and renters in comfort related information on EPCs. • Comfort asset rating must be followed by comfort operational rating for more accurate assessment when the building is occupied. • Further studies are required at a national level to determine which comfort indicators are relevant for national EPCs. • The current national policy framework is not supportive of the comfort feature integration in national EPCs as the level of information overstrains the EPC system in general.
Policy measures required for large-scale deployment	• Define comfort indicators and methodology to measure them. Inform public and professionals about the indicators and their relevance. Comfort should be a part of public tenders. It would work better in cases where there are a large number of users in the buildings (e.g. schools).
Evaluation	Estimation of the quantitative replicability potential

Integrated Environmental and Health Impact Assessment in EPCs

Country(s)	Austria, Belgium, Denmark, Estonia, Greece, Italy, Poland, Portugal, Romania, Scotland
Source (project info links)	https://x-tendo.eu/ X-tendo Feature 3: outdoor air pollution indicator p. 9-16
Contact details	Lukas Kranzl – Project Coordinator Lukas.Kranzl@tuwien.ac.at
EPBD Recast	Articles EPBD-4, EPBD-19
Problem/Motivation	Air pollution is one of the most important environmental risks to human health. Buildings affect both the quality of the outside air (pollutant emission) and the purity of the indoor air (air filtration). The aspect of air pollution in the EPCs of different Members States is covered mainly by the CO2 emission indicator. However, other pollutants are also very important, e.g. in situations where local smog develops.
Short description of practice as implemented	The "Integrated Environmental and Health Impact Assessment in EPCs" in the X-tendo project employs two key indicators: the Local Air Pollution Contributor Index and the Indoor Air Purity Index. These indicators evaluate a building's local smog impact and air filtration efficacy, applicable to various building types, including new, existing, and under-renovation structures. This approach enriches Energy Performance Certificates by incorporating environmental and health aspects, enhancing their relevance and utility.

Evidence on impact	Two types of testing: user testing with 31 participants (e.g., energy auditors, authorities, researchers) using a calculation tool and questionnaire, and in-building testing across 10 buildings in different locations. The tests, conducted from April to November 2021, evaluated the Local Air Pollution Contributor Index and Indoor Air Purity Index, focusing on their applicability, user-friendliness, and the practical challenges in data collection and interpretation.
Lessons learnt / recommendations for large-scale roll-out:	• Prioritise comprehensive pollutant integration for reliable AQI data. • Install monitoring stations in areas lacking air quality data. • Consider indoor/outdoor air quality, energy sources, and filtration. • Address calculation method limitations, like reference data and maintenance. • Simplify the methodology for wider usage. • Engage stakeholders in high-pollution regions for adoption. • Adapt to local contexts and building types. • Ensure compatibility with EPC schemes for integration.
Policy measures required for large-scale deployment	• Set up additional installations for measuring outdoor pollution. • Set up national databases for outdoor pollution. • Besides the existing CO2 indicator and the proposed PM2.5 by the 2021 EPBD, additional pollutants such as PM10, NOx, SOx and CO should be displayed in the EPC.
Evaluation	Estimation of the quantitative replicability potential.

Behavioural Impact Analysis and Performance Gap Closure via EUB SuperHub Platform

Country(s)	Austria, Croatia, Germany, France, Hungary, Italy, Ireland
Source (project info links)	https://eubsuperhub.eu/
Contact details	Peter Gyuris - Project Coordinator coordinator@eubsuperhub.eu
EPBD Recast	Articles EPBD-4, EPBD-19, EPBD-22, EPBD-30
Problem/Motivation	
Short description of practice as implemented	The EUB SuperHub Platform boosts EPCs with a multi-module system including a digital E-passport cockpit, a performance evaluation tool, and a virtual marketplace linking service providers and users. It enhances building energy transparency and efficiency and offers an E-training module for platform use and sustainability skills.
Evidence on impact	The focus groups, involving a diverse range of stakeholders, assess trust in EPCs and their role in decisions, highlighting a need for

	more holistic, transparent sustainability certifications. The "Fast-Effective Survey" prioritises thematic areas for future EPCs, allowing stakeholders to rate their importance, thereby shaping the development of more comprehensive and credible certifications.
Lessons learnt / recommendations for large-scale roll-out:	• Trust and Transparency: Stakeholders viewed current Energy Performance Certificates (EPCs) as lacking transparency, leading to reduced trust and a gap in their effectiveness on decision-making in building sustainability and energy efficiency. • Holistic Approach: There's a need to broaden EPCs to include overall sustainability, environmental impacts, and user considerations, making them more relevant for sustainability goals. • Stakeholder-Driven Improvements: A "Fast-Effective Survey" helped prioritise improvements for next-gen EPCs, ensuring they meet stakeholder needs and expectations, crucial for positive behavioural changes and sustainability performance.
Policy measures required for large-scale deployment	• Mandate EPCs in real estate ads, integrate EPC data with databases, and monitor implementation. • Improve EPC auditor training and standardise certification software. • Review energy infrastructure incentives and establish advisory systems with mandatory energy officers. • Integrate EPCs into building design and require ongoing expert training. • Update and digitise EPCs, adding smartness and comfort indicators, and develop a national system. • Make EPCs digital, user-friendly, and include actual consumption data. • Encourage collaboration and offer financial incentives for energy efficiency.
Evaluation	

Performance assessment using well-defined Key Performance Indicators (KPIs)

Country(s)	Denmark, Ireland, Spain, Greece, Switzerland
Source (project info links)	https://www.chronicle-project.eu/
Contact details	Leon Nielsen – Project Manager lnielsen@fcire.es
EPBD Recast	Article EPBD-3, EPBD-4, EPBD-19
Problem/Motivation	The practice is motivated by the need to improve building performance in terms of energy efficiency, comfort, and well-being.

	Utilising KPIs allows for a more measurable and objective assessment of these factors.
Short description of practice as implemented	The practice involves assessing building performance through well-defined Key Performance Indicators. These KPIs are based on static building design information as well as dynamic sensor measurements, tailored to the building's use, age, and lifecycle stage. This method enables a comprehensive evaluation of various aspects of building performance.
Evidence on impact	
Lessons learnt / recommendations for large-scale roll-out:	
Policy measures required for large-scale deployment	
Evaluation	

Process Upscaling for EPC Methodology Improvement

Country(s)	France, Germany, Spain, Italy, Slovakia, Luxembourg
Source (project info links)	https://epc-recast.eu/
Contact details	Rofaïda Lahrech rofaida.lahrech@cstb.fr
EPBD Recast	Articles EPBD-4, EPBD-15, EPBD-19, EPBD-Annex V
Problem/Motivation	The motivation behind this practice is to improve and optimise the methodology of EPCs.
Short description of practice as implemented	The "Process Upscaling for EPC Methodology Improvement" practice in the EPC RECAST project involves the enhancement and upscaling of the EPC methodology. This includes expanding the scope of EPC assessments to encompass not only energy efficiency but also factors like CO2 emissions, occupant comfort, indoor air quality, and health-related indicators.
Evidence on impact	
Lessons learnt / recommendations for large-scale roll-out:	
Policy measures required for large-scale deployment	
Evaluation	

Recommendation for Cloud System Roll-Out

Country(s)	France, Germany, Spain, Italy, Slovakia, Luxembourg
Source (project info links)	https://epc-recast.eu/
Contact details	Rofaïda Lahrech rofaida.lahrech@cstb.fr
EPBD Recast	Articles EPBD-22, EPBD-19, EPBD-16
Problem/Motivation	The motivation behind this practice is to support the implementation of the new generation EPC methodology by integrating a full cloud system prototype. This addresses the need for a more efficient, technologically advanced approach to building performance assessment.
Short description of practice as implemented	The practice involves proposing the integration and deployment of a cloud-based system prototype as part of the EPC RECAST methodology. This system includes various technology components like a BIM modelling service, consistency checkers, and energy-related data analysis tools. The aim is to enhance the efficiency and accuracy of building energy performance assessments.
Evidence on impact	
Lessons learnt / recommendations for large-scale roll-out:	
Policy measures required for large-scale deployment	
Evaluation	

EPC RECAST Certificate and Renovation Roadmap

Country(s)	France, Germany, Spain, Italy, Slovakia, Luxembourg
Source (project info links)	https://epc-recast.eu/ Deliverable D1.11 https://epc-recast.eu/wp-content/uploads/2024/07/Attachment_0-4.pdf
Contact details	Rofaïda Lahrech rofaida.lahrech@cstb.fr
EPBD Recast	Articles EPBD-22, EPBD-19, EPBD-16
Problem/Motivation	The motivation behind this practice is to improve the impact of EPCs through the certificate and user-centric buildingspecific renovation roadmaps, articulated with building renovation passport

Short description of practice as implemented	The practice specify the EPC template for **residential buildings**, including description of key performance indicators, rating scale, additional indicators as IAQ, SRI, costs, use of metered energy and integrating the renovation roadmap. The EPC RECAST certificate template details the set of building information and data to be reported. The Key Performance Indicators (KPIs) and EPC content are proposed. The EPC template tool in Excel has basic functionalities such as uniform rules for primary energy calculation of from delivered energy, the possibility to adapt the scale to the national ZEB definition and automatic translation based on language selection with 6 currently available language versions.
Evidence on impact	Key performance indicators (KPIs) in terms of EP with focus on harmonisation and transparency; impact of selection of indicators and boundary conditions for calculation are analysed. The EU comparability and transparency of KPIs reported in EPC could be increased by providing more information on the choices and assumptions in calculation method. The table with the main decisions is proposed to be reported in each EPC until calculation are harmonised at the EU level. EU harmonised primary energy is the main indicator but also the national indicator is reported and marked by national flag.
Lessons learnt / recommendations for large-scale roll-out:	Exploiting predicted and actual metered energy for verification of calculation; method and tool for normalisation the metered energy for weather and use has been developed and results are presented in EPC together with calculated energy signature based on EN 15378-3:2017
Policy measures required for large-scale deployment	Two levels of complexity for EPC template are proposed: EPC template for professionals proposed in ALDREN project with individual pages for each additional indicator and the EPC RECAST template with focus on owner and tenant with only 2 pages and a new design showing mandatory indicators required by EPBD recast and most important recommended additional indicators.
Evaluation	The User journey map took place in the consultation process of the project. Two meetings with assessors were organised in Luxembourg in cooperation with the federation of assessors involved in the process of recasting EPC and one in France.

Cross exploitation of energy-related measured data and EP modelling

Country(s)	France, Germany, Spain, Italy, Slovakia, Luxembourg
Source (project info links)	https://epc-recast.eu/

	Deliverable D1.9 https://epc-recast.eu/wp-content/uploads/2024/07/Attachment_0-5.pdf
Contact details	Rofaïda Lahrech rofaida.lahrech@cstb.fr
EPBD Recast	Articles EPBD-22, EPBD-19, EPBD-16
Problem/Motivation	Current EPCs have limitations and deficiencies, including a lack of reliability. The motivation behind this practice is to enhance EPC reliability by exploiting measured energy data and energy performance modelling. The ultimate goal is to provide tools to support EPC assessors in mitigating the gap between predicted and measured energy performance, thereby improving EPC reliability.
Short description of practice as implemented	This practice presents review of current approaches to energy performance assessments, analysis of potential sources of energy-related measured data, proposed protocols to improve energy performance assessment reliability (sets out a methodology for calibrating energy models and improved methodology for assessing operational energy performance).
Evidence on impact	In order to evaluate the problem, the reliability in the energy performance assessments was outlined. EPCs are often perceived as unreliable, and research shows than EPCs can have an error margin between 36-62%. The performance gap was pointed out as the main reason behind unreliable EPCs. In order to identify the best opportunities to improve reliability, the different approaches for performing energy assessments were analysed. The first approach assets energy performance by calculations. This approach uses physical-based tools to model, predict and assess energy consumption. The main sources of uncertainty in simulation models were identified, highlighting following sources of errors: 1) uncertainties of boundary conditions as outdoor climate or use conditions as building usage and occupancy profiles; 2) building physical and operational uncertainty, 3) uncertainty due model inadequacy (related with calculation method and tools); and 4) lack of accuracy of metered data.
Lessons learnt / recommendations for large-scale roll-out:	To achieve more reliable EPCs based on calculations it is required to improve the reliability of input data in simulation models. The second approach assets energy performance by means of using actual energy data that is corrected to standard conditions for operational rating. In this approach the need of improved methodologies to process actual energy data considering shorter periods of available information was highlighted. Main sources of actual energy related information were identified and briefly analysed, including: 1) energy bills; 2) energy meters; 3)

	IoT sensors and monitoring devices; 4) surveys and questionnaires to building users; and 5) on-site tests. From the analysis it was concluded that the minimum desirable level of information is that provided by energy bills, which are reliable and accessible. On the other hand, it was also highlighted the significant deployment of the smart meters along the EU Member States representing a great opportunity to access to detailed real consumption data in an easy and affordable manner. The main reasons for gap were: - Big parts of building volume were not heated as assumed in calculation (e.g., summer kitchen without heating system) - Air-exchange rate with new windows is always lower than hygienic minimum assumed in calculation that is n=0.5 1/h. - DHW is not measured separately, some rough estimation based on summer data can harm good correlation.
Policy measures required for large-scale deployment	The method proposed in EPC RECAST for assessing operational energy performance can be used for existing buildings for both purposes specified in the revised Energy Performance of Buildings Directive (EPBD) of 24 April 2024, that are the use of metered energy to calculate energy performance or verify the correctness of calculated energy use for heating and predicted energy savings especially in connection with the financial schemes.
Evaluation	Developed toolbox was tested in 5 Spanish pilots, concluding that the performance gap was reduced in all cases. The normalisation of measured data was applied to 9 pilot buildings (5 Slovak pilot buildings SK01, SK02, SK03, SK04, SK05, 1 Italian IT05, 1 French FR17, 2 Luxemburg pilot buildings LU01, LU04)

Data acquisition protocol for the geometry and semantics within the onsite visit

Country(s)	France, Germany, Spain, Italy, Slovakia, Luxembourg
Source (project info links)	https://epc-recast.eu/ Deliverable D1.5 https://epc-recast.eu/wp-content/uploads/2024/07/Attachment_0-6.pdf
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EPBD Recast	Articles EPBD-22, EPBD-19, EPBD-16

Problem/Motivation	Current EPCs have limitations and deficiencies, including a lack of reliability. The motivation behind this practice is to define the data acquisition technique as part of an EPC visit.
Short description of practice as implemented	This practice presents process for acquiring the DM using innovative 3D and AR (Augmented Reality) technology to capture volumes and plans and enrich the data with pictorial (photo) and structured (Technical) information at individual housing scale. The process of 3D scanning by drone is also introduced to provide geometric and thermographic information at building scale.
Evidence on impact	Static and dynamic data related to the building and its use will be acquired. The static data extraction tool will build an IFC model for building geometry semi-automatically using AR2BUILD (TC1) technology, with little user action required. IR drone scanning (TC2) technology will also be integrated as an additional feature for projects in which information about the building envelope of the entire building needs to be taken into account. The generated geometric plan of the building (including window and door detection) will be complemented by a checklist to add information first at room-by-room level and then at the building level. Geometric models will be made compatible with energy simulation tools using the IFC- 2-IDF (TC7) conversion tool.
Lessons learnt / recommendations for large-scale roll-out:	There are 2 types of information captured by the BIMEO process: ➢ Geometric data: information captured by shape recognition integrated into the application. This data is built according to a geometric algorithm based on the definition of a part. The data will be delivered according to ifc formats (2x3 or 4). ➢ Descriptive information: Information entered by the operator following his observation either directly or by a specific instrumentation. The data will be transmitted according to a CSV format to be built.
Policy measures required for large-scale deployment	
Evaluation	

EPC Data and EP assessment method from ISO/CEN

Country(s)	France, Germany, Spain, Italy, Slovakia, Luxembourg

Source (project info links)	https://epc-recast.eu/ Deliverable D1.3 https://epc-recast.eu/wp-content/uploads/2024/07/Attachment_0-7.pdf
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EPBD Recast	Articles EPBD-22, EPBD-19, EPBD-16
Problem/Motivation	To make the EPCs more reliable, particular attention must be paid to the reliability of the data that allow the evaluation of the key performance indicators. These building characterisation data concern the intrinsic characteristics of the various envelope components and HVAC systems, they are qualified and quantified mainly during the on-site inspection of the building and according to some information and documents that can be obtained and consulted before the visit. For existing buildings, assessors are faced with the crucial problem of the difficulty of collecting reliable data without having to resort to extensive, long, and costly investigations. Indeed, the assessor only has a short time for the building inspection, so it is essential that he can rely on a structured protocol that allows a reliable of data and information to be collected.
Short description of practice as implemented	Considering the process "building energy performance assessment" by simulation, it is necessary to make the link between this data and information collected and the input data of the calculation method adopted for this evaluation. In the EPC RECAST Data Model, for each of the components, we have proposed different data collection possibilities to consider the diversity of situations from the complete lack of information to the most specific case according to technical documents allowing a precise characterisation of the component. The EPC RECAST calculation procedure principles try to identify and transform choices in Annex A of EPB standards into more user-friendly questions and sub-questions for description of calculation methodologies, that can be easily answered by assessors, by experts for national calculation methods development and by software companies.
Evidence on impact	EPC RECAST Data Model was developed, which based on generic building description, ensuring that the structure and data model could be efficiently used by assessors, while addressing a detailed calculation method after conversion.
Lessons learnt / recommendations for large-scale roll-out:	We had initially imagined a 'Data Model' which goes beyond the collected data during the inspection phase, but which also continues with the input data of the calculation methods. After some initial investigations, we did not retain this option, because the

	national calculation methods differ from each other and generating and implementing such developments is very complex and could not be finalised within the framework of this project. We therefore opted for the development of a 'Data Model' relating to the collection of information and data during the building inspection phase. Several arguments favour this choice: 1/ The data collection protocol for the description of a building could be harmonized and enriched by the different national practices, it is 'universal', 2/ each country can benefit from this data model since it covers all the possible data to be collected, takes into account national specificities and presents real added value since it takes advantage of the different national good practices which are de facto shared, 3/ whatever the calculation method used, there is always a need to have on-site characterization of the building to then transform the data and information collected into calculation input data, expressed in different ways depending on the calculation methods, 4/ this Data Model was implemented and used in the pilot projects (WP3), the links with the calculation method were made according to the calculation method. 5/ Proof of concept that a detailed hourly method can be used with a generic Data Model.
Policy measures required for large-scale deployment	To define a European and harmonized protocol in the form of a "Data Model" for the description of the building. Develop and integrate enrichment and verification methods into this protocol and link this protocol to existing technical components, all to facilitate and make the data collected more reliable
Evaluation	

EU-standards compliance report and guidelines

Country(s)	France, Germany, Spain, Italy, Slovakia, Luxembourg
Source (project info links)	https://epc-recast.eu/ Deliverable D5.8 https://epc-recast.eu/wp-content/uploads/2024/07/Attachment_0-13.pdf
Contact details	Rofaïda Lahrech rofaida.lahrech@cstb.fr
EPBD Recast	Articles EPBD-22, EPBD-19, EPBD-16
Problem/Motivation	The revised EPBD aims to enhance the quality, reliability, and comparability of EPCs. However, with the new EPBD recast and a step towards more harmonized indicators, some default options in EPB standards need revision.

Short description of practice as implemented	The aim of this practice was to evaluate the compliance of the next generation EPC with EU standards, monitoring and analysing the technical and demonstration activities of the project to ensure a technology-neutral approach and transparent presentation of results using International and European standards, particularly ISO/CEN standards developed under Commission mandate M/480 to CEN, CENELEC, and ETSI. The focus was on: - Technical neutrality - Presentation of results is in a transparent manner - ISO/CEN standards developed under Commission mandate M/480 use and the national and regional choices presentation on a comparable basis - The compliance with EPBD recast as some definitions are now missing and some default options in standards are not in line with the EPBD recast
Evidence on impact	Today Member States use different choices and assumptions for calculating energy performance, affecting the numeric indicators expressed in kWh/(m^2.a). These differences impact efforts to achieve energy savings and compliance with EU standards. The comparisons in involved partners countries is presented. To ensure the transparency in the national decisions and for understanding indicators in national EPCs by stakeholders the EU Comparability Table is proposed that aims to increase transparency and comparability between national EPCs by providing information on the main assumptions for energy calculation. A user-friendly spreadsheet questionnaire for comparing national methodologies with CEN standards has been proposed, highlighting important and crucial choices identified by U-Cert project.
Lessons learnt / recommendations for large-scale roll-out:	Recommendations for steps towards implementation of EPB standards in line with EPBD are presented. The main steps are: - Using transparent EPC indicators - Clear definitions for a harmonised implementation and consistent databases - EPC content to make EPCs more comparable and ready for different uses - Description of national calculation methodologies in Annex A, simplified user-friendly description with extract of most important and critical decisions for stakeholders - Update of EPB standards

	- Verification by metered energy - Common EU calculation kernel for transparent calculation of indicators, existing commercial software validation and finally consistent data in databases.
Policy measures required for large-scale deployment	
Evaluation	

Incorporation of non-energy aspects to building assessment

Country(s)	
Source (project info links)	https://www.smartlivingepc.eu/en/ D2.1 Asset methodology assessment in building level
Contact details	Dr. Dimosthenis Ioannidis - djoannid@iti.gr
EPBD Recast	Articles EPBD-3, EPBD-15, EPBD-19
Problem/Motivation	The narrow focus of conventional energy rating systems fails to capture the broader spectrum of factors influencing a building's environmental impact and overall performance. Buildings are spaces for human occupancy, occupant's well-being and satisfaction should be put at the forefront, aiming to enhance the overall quality of life for building users.
Short description of practice as implemented	Non-energy assessment evaluates aspects that impact the comfort and quality of life in a building, such as indoor air quality, acoustics, thermal comfort, lighting, accessibility, and functionality. Important non-energy factors that contribute to IEQ (indoor environmental quality) include things like air quality, temperature, illumination, and noise. Important non-energy issues include safety, radon danger, earthquake potential, accessibility, flexibility, and ecological sustainability.
Evidence on impact	
Lessons learnt / recommendations for large-scale roll-out:	
Policy measures required for large-scale deployment	
Evaluation	

Introduction of new rating scheme at the building complex level

Country(s)	
Source (project info links)	https://www.smartlivingepc.eu/en/ D2.1 Asset methodology assessment in building level D2.2 Asset assessment methodology in complex level
Contact details	Dr. Dimosthenis Ioannidis - djoannid@iti.gr
EPBD Recast	Articles EPBD-4, EPBD-9, EPBD-22
Problem/Motivation	Despite various existing rating systems and assessment tools, a coherent, comprehensive, and uniform methodology is still lacking to gauge the energy performance of buildings accurately. Moreover, the available frameworks often fail to consider vital non-energy aspects and fail to integrate multiple evaluation parameters into a single, cohesive rating system.
Short description of practice as implemented	By recognizing the interconnectedness of buildings within a complex, this innovative approach ensures a more accurate and relevant evaluation of collective energy performance and sustainability attributes.
Evidence on impact	The project aspires to develop a new rating scheme for neighbourhood scale, based on the assessment of individual building units and additional building complex parameters with the aim of energy performance certification of building complexes. The energy infrastructure and services on a building block scale, as well as the interaction of the block buildings, were studied.
Lessons learnt / recommendations for large-scale roll-out:	
Policy measures required for large-scale deployment	
Evaluation	

Recommendations on integration of Next-generation dynamic EPC in national certification scheme

Country(s)	Austria, Greece, Germany, Lithuania, Netherlands, Cyprus, Spain
Source (project info links)	D^2EPC – Deliverable 6.6 Recommendation report on integration of NG EPC in national/regional certification schemes v2, p.51-53
Contact details	Panagiota Chatzipanagiotidou: phatzip@iti.gr
EPBD Recast	Articles EPBD-4, EPBD-15, EPBD-19, EPBD-27

Problem/Motivation	Limited information on the actual energy performance of buildings, insufficient information to building users and limited user-friendliness, need for harmonisation of EPCs with the smart city concept, need for human-centric certificate, higher software credibility and quality.
Short description of practice as implemented	Current implementation of the EPC and related schemes and tools in EU countries. Examination of the integration of the NG EPCs into the national/regional schemes of the partner countries.
Evidence on impact	Testing and validation on 6 pilot sites
Lessons learnt / recommendations for large-scale roll-out:	The EPC is an important and effective tool for informing end-users about the performance of a building. An EPC can be based on calculated pre-defined parameters or on actual energy consumption.
Policy measures required for large-scale deployment	• Collect Real Energy Consumption Data: understand current EPC systems and identify gaps, address the lack of real-time data collection, ensuring access for end-users. • Provide easily understandable information in the EPC; use actual energy consumption data for performance assessment; establish a dedicated platform for building users to monitor and regulate energy habits. • Integrate SRI with EPC for smarter, low-energy buildings; use SRI as a monitor linked to the current EPC for understanding building potential; visualise EPCs in a GIS environment for efficient energy planning. • Integrate Infrastructure and Human-Centric Indicators: use additional indicators for a dynamic EPC; utilise 6D Level 3 BIM and cloud-based environments for improved effectiveness. • Improve EPC accuracy by linking to IoT and providing BIM documentation. • Combine EPC calculation with building energy performance simulation, ensure BIM models include energy-related information for an as-built model. • Conduct regular training for energy consultants and assessors, emphasising digitalisation. • Integrate LCA-based indicators into EPCs for environmental impact assessment. • Develop standard procedures for operational rating applicable across all Member States; establish standardisation working groups for operational rating. • Implement stricter motivational schemes to address building energy consumption, use EU Emissions Trading Scheme infrastructure for financial penalties and rewards based on real energy consumption.

Evaluation	Stakeholder meetings and workshops: Stakeholders from most EU countries; 22 workshops with 690 participants in the 7 D^2EPC MSs about the D^2EPC framework in relation to the currently implemented EPC schemes.

Country(s)	Austria
Source	Https://projekte.ffg.at/projekt/3420963
Contact details	FH Salzburg, TU Vienna, Zukunftsagentur Bau
TABS	TABS im EA (thermally activated component systems)
Problem/Motivation	The energy performance indicators of buildings with thermally activated building component systems (TABS) are often presented in the energy performance certificate (EPC) as being worse than is the case in reality.
Short description of practice	The aim of the project was to identify levers for a more realistic representation of TABS in the EPC and to formulate proposals for revising the calculation. In the course of the project, the correction factor for surface heating was identified as one of the parameters for which a revision of the calculation method would be useful. For this reason, this parameter in particular was analysed more closely with the help of component simulations and a proposal for the future calculation method and for the further development of this factor was generated.
Evidence on impact	
Lessons learnt / recommendations for large-scale roll-out:	
Policy measures required for large-scale deployment	
Evaluation of policy measure	

EPC and Indoor Environment Quality Integration

Country(s)	EU countries
Source (project info links)	https://www.smartlivingepc.eu/en/ D3.1 Operational assessment methodology in building level
Contact details	Phoebe-Zoe Georgali

	Res.gp@frederick.ac.cy
EPBD Recast	Article EPBD-7, EPBD-15
Problem/Motivation	
Short description of practice as implemented	This practise emphasises a significant stride towards harmonizing European building standards with sustainability and resource efficiency principles, enable to make informed decisions that promote sustainable practices, enhance the quality of indoor environments, optimize asoperated considerations, examine financial assets, and ultimately foster exemplary performance at the building complex level.
Evidence on impact	
Lessons learnt / recommendations for large-scale roll-out:	
Policy measures required for large-scale deployment	
Evaluation	

Improving building operation with enhanced EPCs

Country(s)	Austria, Croatia, Cyprus, Italy, Slovenia, and Spain
Source (project info links)	https://timepac.eu/ D3.4 https://timepac.eu/reports/report-on-improving-building-operation-with-enhanced-epcs/
Contact details	Leandro Madrazo Agudin – Project Coordinator leandro.madrazo@salle.url.edu
EPBD Recast	Articles EPBD-19, EPBD-8, EPBD-16, EPBD-22
Problem/Motivation	EPCs may not reflect a building's actual energy performance due to outdated or incomplete data and lack of standardisation. Varying methods, tools, and experts used for assessment can lead to inaccurate input data.
Short description of practice as implemented	The purpose of this practice was to share the visions of enhanced building performance developed "Transversal Deployment Scenarios" (TDS) with local actors involved in building performance certification and to provide insights into the knowledge gaps to be fulfilled by the training scenarios/
Evidence on impact	Workshops conducted in five partner countries: Austria, Croatia, Cyprus, Italy, and Slovenia. Through these workshops, valuable insights were gathered, aiding in the identification of training

	requirements necessary for participants to actively contribute to the advancement of current certification practices.
Lessons learnt / recommendations for large-scale roll-out:	- Integration of operational data in EPCs enhances their value for investment projects and brings them closer to energy audits, benefiting potential investors and promoting robust financing options such as Public Private Partnerships. - Ensuring data accuracy is paramount for reliable energy auditing and EPC calculations, necessitating streamlined procedures in data collection and validation. - Digitalization plays a crucial role in accessibility and effectiveness, allowing professionals and auditors to leverage energy models and ensuring interoperability of datasets for optimization. - End-users priorities accurate building certificates that reflect property value, seek benchmarks for informed investment decisions, and recognize the importance of considering "hidden" benefits such as thermal comfort, ultimately valuing the enhanced benefits of their work or property.
Policy measures required for large-scale deployment	
Evaluation	

Development of digital building logbooks - new generation of EPCs

Country(s)	Austria, Croatia, France, Germany, Hungary, Ireland, Italy
Source	https://eubsuperhub.eu/
Contact details	Peter Gyuris - Project Coordinator coordinator@eubsuperhub.eu
EPBD Recast	Article EPBD-22, EPBD-16, EPBD-15, EPBD-12, EPBD-13, EPBD-23 EPBD-24
Problem/Motivation	In the era of developed digitalisation, it is obvious that digitalisation in the construction sector is still lagging behind other sectors. There are already many different databases in EU countries, which focus primarily on one topic area. A database that covers the entire building life cycle, from the design phase through the construction, operation, performance, maintenance, and deterioration is needed, to consolidate all relevant building data across the EU. A digital building logbook is becoming a necessity in the era of digitalisation, containing all relevant building-related data over the whole life cycle of a building, providing different types of

	stakeholders with different information for different purposes at the right time.
Short description of practice	The elaborated EUB SuperHub digital building logbook data structure contains the following eight main categories: 1. Administrative Information, 2. General Building Information, 3. Building Element Information, 4. Building Operation and Use, 5. Building Performance, 6. Smart Readiness, 7. Finance, 8. Building Documentation BIM. Out of the eight categories of the digital building logbook, the largest one in terms of information volume is the specific building element information. This category covers the building envelope and the technical building systems. The second largest category pertains to information regarding building performance and certificates across various metrics, such as energy, sustainability, and selected key performance indicators like lifecycle cost and global warming potential, indoor air quality, thermal comfort, and greenhouse gas emissions, among others. These categories of the digital building logbook are designed to contain all information possibly necessary for any work related to a building's life cycle, to facilitate availability and flow of information and to improve the overview of building stock, energy efficiency upgrades where applicable, data-informed decision-making and policy development, and ultimately, the monitoring of progress towards decarbonisation of the sector.
Evidence on impact	The EUB Superhub project aims to implement 100 case studies to test the developed EUB SuperHub online platform, which is based on the digital building logbook.
Lessons learnt / recommendations for large-scale roll-out:	The main goal is not to establish another new database, which would be both time and cost consuming. The digital building logbook needs to act as a common gateway to access data and bring data from different sources together by linking with existing, reliable, building information databases (e.g., national EPC database, regular inspections of heating and AC systems, national cadastre, property price/leases register, etc.). Based on the Article 19 of the newest proposal for a directive on the energy performance of buildings, published in December 2023, the national database for energy performance of buildings needs to be interoperable and integrated with digital building logbook. The EUB SuperHub digital building logbook needs to: • be applicable for the entire building stock (residential and non-residential buildings), • collect and monitor all relevant building data within the entire building life cycle, • be ease of use (simplicity, user friendly),

	• be easily understandable and usable by different stakeholders who have different information needs, use data in different ways and for different purposes, • become a common gateway to access data and bring data from different data sources together by linking with other existing reliable building information databases, • use hybrid approach to data storage, • comprise at least the following data (elements, indicators) within DBL data structure: physical accessibility (design for all), history about any major renovation or replacement, records about materials used (material passport), energy efficiency classes (EU energy labels), BACS efficiency class (EN 15232-1, building maintenance history, Smart Readiness Indicator (SRI), E-mobility – infrastructure for electric vehicle recharging, operational costs, Life cycle Global Warming Potential (GWP).
Policy measures required for large-scale deployment	Make digital building logbooks mandatory for all new buildings and existing buildings undergoing renovation.
Evaluation of policy measure	Monitoring data entered in digital building logbooks. Monitoring of progress towards decarbonisation of the construction sector.

Update to U-values and heat loss requirements in Hungary

Country(s)	Hungary
Source	Presentation on "Current Situation Concerning EPC in Hungary"
Contact details	Anita Terjék - aterjek@emi.hu
EPBD Recast	Article EPBD-7, EPBD-5
Problem/Motivation	The existing U-values and heat loss requirements for building components in Hungary needed updating to meet new energy efficiency targets and align with EU requirements.
Short description of practice	The U-values for various building components, including facade walls, flat roofs, and transparent elements, were updated to improve energy efficiency. For example, the U-value for facade walls was set at 0.24 W/m^{2}K, and for glass at 1.0 W/m^{2}K. Additionally, the maximum heat loss coefficient requirements were introduced for new buildings and major renovations. These updates are part of Hungary's ongoing effort to meet nearly zero-energy building (NZEB) requirements.
Evidence on impact	
Lessons learnt / recommendations for large-scale roll-out:	

Policy measures required for large-scale deployment	
Evaluation of policy measure	

The new CO2 emission requirements for EPC in Hungary

Country(s)	Hungary
Source	Presentation on "Current Situation Concerning EPC in Hungary"
Contact details	Anita Terjék - aterjek@emi.hu
EPBD Recast	Article EPBD-5, EPBD-7, EPBD-11
Problem/Motivation	The requirement for a specific share of renewable energy in EPCs was outdated, and a new metric for CO2 emissions was needed to improve environmental impact assessments.
Short description of practice	Hungary's new EPC regulations include a specific CO2 emission limit for new buildings, set at 20 kg/m^2/year for residential buildings. For other building categories, CO2 emissions must be calculated relative to a reference building. This change emphasizes lifecycle-based CO2 emissions rather than renewable energy use, aligning Hungary with modern sustainability goals.
Evidence on impact	
Lessons learnt / recommendations for large-scale roll-out:	
Policy measures required for large-scale deployment	
Evaluation of policy measure	

EPC classification changes in Hungary

Country(s)	Hungary
Source	Presentation on "Current Situation Concerning EPC in Hungary"
Contact details	Anita Terjék - aterjek@emi.hu
EPBD Recast	Article EPBD-19, EPBD-9
Problem/Motivation	The previous EPC classification system in Hungary was too complex, with additional classification criteria that often placed buildings in lower categories than justified.

Short description of practice	The EPC classification system in Hungary has been simplified, returning to a single-letter notation. The "BB" category for nearly zero-energy buildings has been replaced by "A2023." This classification is based on both energy performance and CO2 emissions. The change aims to simplify the classification process and make it more logical for building owners and assessors.
Evidence on impact	
Lessons learnt / recommendations for large-scale roll-out:	
Policy measures required for large-scale deployment	
Evaluation of policy measure	

Introduction of Renovation Passport in Hungary

Country(s)	Hungary
Source	Presentation on "Current Situation Concerning EPC in Hungary"
Contact details	Anita Terjék - aterjek@emi.hu
EPBD Recast	Article EPBD-12, EPBD-19
Problem/Motivation	To meet EU directives on deep renovations, Hungary required a more structured approach to renovation planning in its EPC framework.
Short description of practice	Hungary has introduced a Renovation Passport as part of its EPC regulation updates. The Renovation Passport outlines a multi-step renovation roadmap for certified buildings. This passport includes a detailed schedule of renovation steps and a risk assessment. It aims to facilitate deep renovations in line with EU energy efficiency targets.
Evidence on impact	
Lessons learnt / recommendations for large-scale roll-out:	
Policy measures required for large-scale deployment	
Evaluation of policy measure	

4 Databases and Tools

4.1 Summary – to follow

4.2 Practices

Characteristics of a successful EPC scheme

Country(s)	Bulgaria, Germany, Greece, Hungary, Latvia, Spain, Sweden
Source (project info links)	https://qualdeepc.eu/ QualDeEPC – Deliverable D2.2 Report on EPC best practices, p.9-21; 45-53
Contact details	mail@qualdeepc.eu
EPBD Recast	Article EPBD-19, EPBD-27
Problem/Motivation	High-quality Energy Performance Assessment and Certification in Europe Accelerating Deep Energy Renovation.
Short description of practice as implemented	The existing EPC schemes and their characteristics are analysed to identify the key success factors to deliver a high-quality EPC scheme.
Evidence on impact	
Lessons learnt / recommendations for large-scale roll-out:	The most important successful factors for EPC scheme are Transparency, Reliability and Functionality/Usability. The other factors: Cost-effectiveness, Comparability and Neutrality, are estimated with medium importance for the success of EPC schemes.
Policy measures required for large-scale deployment	For a successful EPC scheme, EU Member States should combine many different individual measures and tools towards enhanced EPC schemes fulfilling the four main functions: • Improving the usefulness and use of EPCs for supporting deep renovation • Usefulness and use of EPCs in building markets • Improving the quality and precision of EPCs in general • Certification and training of EPC assessors/issuers
Evaluation	A country-specific assessment was also implemented, based on averaged normalised total weighted score. A study conducted to compile existing good practices and examples for innovative solutions was performed and analysed.

Implementation of a Semantically Enriched Building Information Modelling Based Common Data Environment (CDE)

Country(s)	Denmark, Ireland, Spain, Greece, Switzerland
Source (project info links)	https://www.chronicle-project.eu/

Contact details	Leon Nielsen – Project Manager lnielsen@fcire.es
EPBD Recast	Articles EPBD-16, EPBD-22
Problem/Motivation	Enhancing the efficiency and effectiveness of data management and collaboration in building lifecycle management, with a focus on improving building performance in terms of sustainability and energy efficiency.
Short description of practice as implemented	The CHRONICLE Common Data Environment (CDE) is a semantically enriched, BIM-based tool designed for the efficient management of both static and dynamic building information throughout the building's lifecycle. It facilitates the sharing, management, and storage of relevant data among various stakeholders, such as AEC, building owners, etc., and integrates with other CHRONICLE tools.
Evidence on impact	
Lessons learnt / recommendations for large-scale roll-out:	
Policy measures required for large-scale deployment	
Evaluation	

3D Visualisation & Monitoring Platform (ChroViewFM) for monitoring real-time data from smart equipment

Country(s)	Denmark, Ireland, Spain, Greece, Switzerland
Source (project info links)	https://www.chronicle-project.eu/
Contact details	Leon Nielsen – Project Manager lnielsen@fcire.es
EPBD Recast	Articles EPBD-15, EPBD-16, EPBD-19, EPBD-22
Problem/Motivation	Enhancing the monitoring and management of building performance, particularly focusing on real-time data capture for energy efficiency, comfort, and maintenance planning.
Short description of practice as implemented	ChroViewFM is an online BIM-based tool enabling 3D visualisation of buildings and monitoring of near-real-time data from smart equipment. This includes energy consumption, environmental conditions, and other performance indicators. It provides a user-friendly interface for tracking energy use, comfort levels, and identifying significant changes over time, facilitating predictive and preventive maintenance of buildings.

Evidence on impact	
Lessons learnt / recommendations for large-scale roll-out:	
Policy measures required for large-scale deployment	
Evaluation	

Knowledge Exchange Centre for EPCs

Country(s)	European Union
Source (project info links)	https://crosscert.unizar.es/
Contact details	Eva Suba: e.suba@klimabuendnis.org
EPBD Recast	Articles EPBD-29, EPBD-22
Problem/Motivation	The need for a centralised repository of information on next-generation EPCs for buildings in the EU. Need to improve the accuracy, usability, and harmonisation of EPCs, as well as to facilitate knowledge exchange among stakeholders.
Short description of practice as implemented	The Knowledge Exchange Centre is a web-based repository of information on next-generation EPCs for buildings in the EU. It serves as a centralised platform for sharing knowledge, research findings, and best practices related to EPCs. It includes themes such as the analysis of current EPC methodologies, legislation, EU projects, and a building repository. Additionally, the Centre hosts a community forum for stakeholders involved in EPC implementation.
Evidence on impact	
Lessons learnt / recommendations for large-scale roll-out:	
Policy measures required for large-scale deployment	
Evaluation	

Interoperability of EPC Databases

Country(s)	Spain, Croatia, Malta, UK, Slovenia, Greece, Poland, Bulgaria, Denmark, Austria

Source (project info links)	D4.2 Analysis of the current integration of EPC data https://www.crosscert.eu/our-solutions/deliverables
Contact details	Eva Suba: e.suba@klimabuendnis.org
EPBD Recast	Articles EPBD-22, EPBD-16
Problem/Motivation	Identification of the current status of the existing databases and the barriers and challenges still to overcome to achieve fully interoperable and useful EPC databases.
Short description of practice as implemented	D4.2 has been planned to focus and expand the information on the potential uses for EPC databases
Evidence on impact	The concepts of EPC storage, processing, interaction, and interoperability are readily understood. In addition, dividing concepts and tools allows the generation of tailor-made guidelines for each stage of the EPC life cycle.
Lessons learnt / recommendations for large-scale roll-out:	
Policy measures required for large-scale deployment	Different guidelines have been proposed as a common road map to achieve harmonisation and potential value for the existing databases.
Evaluation	

Integrating Implemented Building Performance Tools into a Digital Building Logbook

Country(s)	Denmark, Ireland, Spain, Greece, Switzerland
Source (project info links)	https://www.chronicle-project.eu/
Contact details	Leon Nielsen – Project Manager lnielsen@fcire.es
EPBD Recast	Articles EPBD-22, EPBD-19, EPBD-15
Problem/Motivation	Many buildings have separate assessments and certificates, such as EPC and SRI, which may not be readily accessible or integrated. The integration of these tools into a 'Digital Building Logbook' aims to streamline data management and improve decision-making regarding building performance.
Short description of practice as implemented	The practice involves methodologically integrating existing building performance tools, such as dynamic EPC and SRI, into a centralised 'Digital Building Logbook.' This logbook serves as a comprehensive repository for building performance data, enabling

	easy access and analysis of information related to energy efficiency and readiness indicators. The integration process ensures that data from these tools can be effectively utilised for building management and optimisation.
Evidence on impact	
Lessons learnt / recommendations for large-scale roll-out:	
Policy measures required for large-scale deployment	
Evaluation	

Building Repository-Enhanced EPC Management

Country(s)	Austria, Bulgaria, Spain, Greece, Poland
Source (project info links)	https://www.crosscert.eu/ https://crosscert.unizar.es/building-repository/ CrossCERT – Deliverable D2.8 crossCert Benchmark Repository p.3
Contact details	Eva Suba: e.suba@klimabuendnis.org
EPBD Recast	Article EPBD-22, EPBD-19
Problem/Motivation	The level of detail offered by other existing databases is not sufficient for the development of building energy models (for validation or sensitivity analysis) or for use as a testbench of new EPC procedures.
Short description of practice as implemented	The crossCert building repository provides very detailed building data (such as (building envelope characteristics and technical systems), results of energy certificates, energy consumption data and even examples of dynamic models for some of the buildings. These data have been curated and, where needed, anonymised to circumvent restrictions on its use.
Evidence on impact	
Lessons learnt / recommendations for large-scale roll-out:	
Policy measures required for large-scale deployment	
Evaluation	

Characteristics of a successful EPC database

Country(s)	Italy
Source (project info links)	SIAPE public portal (implemented by ENEA in 2020): https://siape.enea.it/ Annual reports on building energy certification: https://www.efficienzaenergetica.enea.it/pubblicazioni/rapporto-annuale-sulla-certificazione-energetica-degli-edifici.html
Contact details	Info -> Contact section in https://siape.enea.it/
EPBD Recast	Articles EPBD-22, EPBD-19
Problem/Motivation	SIAPE is the Italian National Informative System on EPC (Sistema informativo sugli APE, in Italian). It was established by the Italian government through the Ministerial Decree 26/06/2015, implementing the Directive 2010/31/EU. The primary purpose of SIAPE is to return a detailed picture of the state of the art of energy refurbishment in the national building stock.
Short description of practice as implemented	Italian EPCs are issued by Regions and Autonomous Provinces (21 entities in total) and collected in their local registers. By March 31st of each year, Regions and Autonomous Provinces should send EPCs issued the previous year to the national EPC DataBase Management System (DBMS), which is part of SIAPE. SIAPE was developed by ENEA in 2016, which also is the authority entitled to maintain it. Furthermore, the SIAPE structure was updated in 2020 by ENEA which is in charge of ensuring and facilitating the connection between SIAPE and the local energy registers. ENEA also supports some of the Italian Regions in developing their EPC register and performs several analyses on the EPC information.
Evidence on impact	From 2016 to the end of 2023, SIAPE has collected data on the certified building stock of 19 Italian Regions and Autonomous Provinces, reaching the amount of about 5,300,000 EPCs. The data collected in SIAPE allow to carry out studies and analyses, the results of which are mainly published in the National reports on building energy certification of buildings in Italy, published every year from 2020 by ENEA and the Italian Thermotecnical Committee (CTI). Through the SIAPE Portal, part of the data collected in the Italian national EPC DBMS is publicly available and the results obtained through their analysis can be consulted in an aggregated form. This tool allows any kind of user to share information on the energy performance of the Italian building stock and to increase awareness of building energy consumption.

Lessons learnt / recommendations for large-scale roll-out:	The management of EPC data at both the local and national levels has pros and cons: on one side it allows more control of the territory and greater communication with the stakeholders involved in the certification process; on the other side, it can lead to harmonisation problems, especially when the national laws are implemented differently. The quality of the EPC data is another crucial point. Currently, the official control systems are at the regional level and in most cases are applied only after the EPC is issued. Lastly, the EPC registry should be able to dialogue with other national and local systems, to connect different data from different sources.
Policy measures required for large-scale deployment	Promotion of more stringent national guidelines to harmonise the EPC scheme, output, and control system. Development of control systems to be applied also before the EPC is collected in the registry. A higher involvement of significant stakeholders that are part of the certification process (Regions and Autonomous Provinces, software houses, assessors, citizens). Promotion of protocols to facilitate the connection between different databases.
Evaluation of policy measure	Data monitoring and interviews with the relevant stakeholders.

Development of digital One-stop-shop platform built upon Digital Building Logbook

Country(s)	Austria, Croatia, France, Germany, Hungary, Ireland, Italy
Source	https://eubsuperhub.eu/
Contact details	Peter Gyuris - Project Coordinator coordinator@eubsuperhub.eu
EPBD Recast	Article EPBD-18, EPBD-22, EPBD-29
Problem/Motivation	Meeting the demands of all the construction sector value chain in one place and connecting all stakeholders, from developers and contractors to tenants and maintenance teams.
Short description of practice	The EUB SuperHub project supports the evolvement of the next generation of building certification: moving towards sustainability and smartness by developing the EUB SuperHub online platform based on the digital building logbook. The envisioned EUB SuperHub online platform contains four separate modules representing different activities and stakeholders relevant to a building: the planning and verification

	tool (PVT), the E-cockpit, the virtual marketplace (VM), and the E-training module. The e-cockpit is a multi-scale cloud-based geo-referenced interactive database, that will allow a wide array of stakeholders to view key information about the existing building stock and related certificates (e.g., EPC, sustainability certificates, SRI, etc.). The planning and verification tool (PVT) module is an extension of the e-cockpit module, enabling building owners to upload, share, and store all building-related information. The PVT module provides building data entry and stores them in a digital building logbook and simulations (what-if scenarios). The virtual marketplace (VM) facilitates the match-making connection between the building users, auditors, and solution and funding providers, as well as other market actors and service providers. The e-training module is an independent part of the EUB SuperHub platform, providing training material for the platform users. All four modules act together and create a digital one-stop-shop accessible to all building stakeholders to address barriers relevant to building renovation and smartness, sustainability, and energy efficiency of the building.
Evidence on impact	The EUB Superhub project aims to implement 100 case studies to test the developed EUB SuperHub online platform and roll-out the next generation certification and EUB e-passport. All selected case studies will be registered using the developed online platform.
Lessons learnt / recommendations for large-scale roll-out:	
Policy measures required for large-scale deployment	
Evaluation of policy measure	

Harmonisation of Datasets of Energy Performance Certificates of Buildings across Europe

Country(s)	Italy, Spain
Source	https://joinup.ec.europa.eu/collection/elise-european-location-interoperability-solutions-e-government/use-case-epc4eu-harmonisation-datasets-energy-performance-certificates-buildings-across-europe
Contact details	APRIE (Italy): info@aprie.it

	CARTIF Foundation (Spain): info@cartif.es EREN (Spain): info@eren.es
EPBD Recast	Articles EPBD-18, EPBD-22
Problem/Motivation	The need for a centralised and standardised approach to EPCs across Europe to address heterogeneous datasets produced at national and regional levels. The lack of uniformity impedes effective monitoring and policy-making regarding the energy performance of buildings.
Short description of practice	The EPC4EU project aimed to design, implement, and test a reusable EPC data model across Europe, starting with Italy and Spain. The project harmonised heterogeneous EPC datasets to create a unified, standardised data model. The practice involved steps such as creating a new target data model (EPC4EU), harmonising real EPC datasets, and developing a web application to make the harmonised datasets accessible to non-GIS experts. This methodology is designed to be extendable to other EU Member States, ensuring consistency and interoperability.
Evidence on impact	The impact was measured by the successful harmonisation of EPC datasets from Italy and Spain into a single data model. This included overcoming challenges related to terminology, geolocation, and mandatory data fields. The harmonised data was made accessible via a web application, improving usability for various stakeholders. Benefits included more efficient policy-making, better support for energy audits and renovations, and increased transparency for consumers.
Lessons learnt / recommendations for large-scale roll-out:	• Careful analysis and adaptation of different national EPC models are crucial. • Standardised terminology and geolocation information are key to successful harmonisation. • Web applications should be developed to facilitate access to harmonised datasets for non-experts. • The methodology should be continuously tested and updated to accommodate new countries and datasets.
Policy measures required for large-scale deployment	• Establishment of a centralised EU-wide EPC database. • Mandating standardisation of EPC data models across Member States. • Providing funding and technical support for Member States to adapt their EPC systems. • Encouraging the use of geospatial data and integration with national cadastral information.
Evaluation of policy measure	• Conducting periodic reviews (every 3-5 years) to assess the consistency and completeness of the centralised EPC database. • Monitoring the number of Member States successfully integrating into the harmonised data model.

	• Evaluating the impact on policy-making efficiency and the effectiveness of energy efficiency measures. • Assessing stakeholder satisfaction and usability of the harmonised datasets through surveys and feedback mechanisms.

National database for EPCs (OÉNY)

Country(s)	Hungary
Source	Presentation on "Current Situation Concerning EPC in Hungary"
Contact details	Anita Terjék - aterjek@emi.hu
EPBD Recast	Article EPBD-22, EPBD-16
Problem/Motivation	Hungary required a centralised system to manage and monitor all Energy Performance Certificates issued within the country, ensuring transparency, accessibility, and compliance with updated regulations.
Short description of practice	The National Building Registry (OÉNY) in Hungary operates the EPC database, where all EPCs issued since 2013 are stored. This database provides a centralised platform for registering, monitoring, and updating EPC data across the country. From January 2024, a new EPC must be issued for all buildings when they are sold, rented, or taken into use. The public can access certain statistical data from the database, while more detailed information is reserved for internal use. The database aims to streamline EPC management and provide a reliable source of information on the energy performance of buildings in Hungary.
Evidence on impact	
Lessons learnt / recommendations for large-scale roll-out:	
Policy measures required for large-scale deployment	The implementation and management of a national database system require governmental oversight to ensure data consistency and accuracy. In addition, EPC assessors and building owners must be educated about the mandatory use of this system for the issuing of EPCs.
Evaluation of policy measure	

Evaluation of the proposed digital tools in the CHRONICLE project – survey results

Country(s)	Denmark, Ireland, Spain, Greece, Switzerland.
Source	https://www.chronicle-project.eu/2024/06/19/article-on-digital-transformation-in-the-building-sector/.

Contact details	Leon Nielsen, Project Manager, Email: lnielsen@fcirce.es.
LATER: EPBD Recast	Articles EPBD-12, EPBD-15, EPBD-16, EPBD-19, EPBD-22
Problem/Motivation	To obtain feedback on the proposed digital tools for building management and renovation planning developed within the CHRONICLE project.
Short description of practice	To conduct a CHRONICLE B2B survey among professional stakeholders in the construction industry regarding digital transformation in the construction sector. Collecting information related to the practical use of Building Information Modelling (BIM), digital tools for monitoring building performance, for renovation planning, with experience with digital construction diaries to store building-related information.
Evidence on impact	A total of 102 professionals from different European countries and with different levels of expertise participated in the survey. Responses were collected from professionals in a variety of building design roles, such as architects and engineers, as well as from the building management sector. The responses represent a range of expertise from small to large scale companies with the majority of responses from Denmark, Lithuania and Spain.
Lessons learnt / recommendations for large-scale roll-out:	
Policy measures required for large-scale deployment	
Evaluation of policy measure	

Assessment of tools for the calculation of the EPC and the SRI

Country(s)	All EU member states (with a focus on countries with available EPC tools)
Source	SmarterEPC project https://lifeprojects.r2msolution.com/public-material-case-studies/ D2.1 https://lifeprojects.r2msolution.com/wp-content/uploads/2024/06/D2.1_Assessment-of-Existing-Tools-for-EPC-and-SRI-Calculation-at-the-European-Level_vF.pdf
Contact details	SmarterEPC - Sophie Dourlens-Quaranta sophie.dourlens@r2msolution.com
EPBD Recast	

Problem/Motivation	A need for a transparent, accessible database of EPC tools used across Europe to enhance harmonisation, compatibility, and understanding of the tools available.
Short description of practice	The primary aim of this practice is to provide a comprehensive overview and critical evaluation of the current tools used for calculating Energy Performance Certificates (EPC) and Smart Readiness Indicators (SRI) across Europe. This evaluation is foundational to enhancing the effectiveness and user-friendliness of these tools, aligning with the project's goal to integrate smart readiness aspects into buildings' energy certification processes. This practice includes: - An extensive documentation of existing EPC and SRI calculation tools, focusing on methodologies, data collection practices, user interfaces, and interoperability features. - An in-depth analysis highlighting the gaps and deficiencies in current tools, with special emphasis on areas for improvement and potential integration with next-generation tools developed under the NextGenEPC projects. - To engage with a wide array of stakeholders, including assessors, building owners, facility managers, public authorities, and design/engineering firms, ensuring that their insights and feedback are integrated into the development and validation of the tools.
Evidence on impact	EPC Tools: Documented and analysed 85 distinct EPC tools across 27 EU member states, evaluating aspects such as data input methods, deployment models, and compliance with regulatory standards. - SRI Tools: Reviewed and documented seven SRI tools, each contributing uniquely to smart building assessments. Key features and technological readiness levels were assessed to provide a comprehensive understanding of the tools' functionalities.
Lessons learnt / recommendations for large-scale roll-out:	
Policy measures required for large-scale deployment	
Evaluation of policy measure	

European Atlas of EPC Tools

Country(s)	All EU member states (with a focus on countries with available EPC tools)
Source	SmarterEPC project – European Atlas of Energy Performance Certificate Tools (https://www.epc-atlas.eu/)
Contact details	SmarterEPC - Sophie Dourlens-Quaranta sophie.dourlens@r2msolution.com
EPBD Recast	
Problem/Motivation	A need for a transparent, accessible database of EPC tools used across Europe to enhance harmonisation, compatibility, and understanding of the tools available.
Short description of practice	
Evidence on impact	
Lessons learnt / recommendations for large-scale roll-out:	
Policy measures required for large-scale deployment	
Evaluation of policy measure	

5 SRI Development and Deployment

5.1 Summary – to follow

5.2 Practices

Development of Web-based SRI Assessment Toolkit

Country(s)	Bulgaria, Latvia, Czech Republic, Romania, Greece, Croatia, Spain, Austria
Source (project info links)	SRIENACT – SRIENACT.EU
Contact details	Stamatia Rizou: srizou@singularlogic.eu
EPBD Recast	Articles EPBD-15, EPBD-22
Problem/Motivation	The need for a unified and efficient approach to SRI assessment across different EU Member States.

Short description of practice as implemented	The SRI-ENACT assessment tool will facilitate the calculation of the SRI and enable the issuing of the SRI assessments. The tool will provide access to several stakeholders (assessors, residents, national authorities, and EU stakeholders) providing different functionalities, such as the tailoring of the SRI methodology at national level, the SRI assessment of buildings, the analysis of the SRI assessments at different scales (national, EU).
Evidence on impact	SRI-ENACT solution will be assessed in 1200 different types of buildings across EU.
Lessons learnt / recommendations for large-scale roll-out:	*To be developed* – The project will actively develop policy recommendations for a global improvement of smart readiness of European buildings, develop concepts for the financing of building smartness upgrades and demonstrate the potential market value of smart readiness of buildings
Policy measures required for large-scale deployment	All countries agree on SRI method B to be employed as the primary method for assessing buildings (exception: Austria needs its own SRI methodology adaptions and Bulgaria will address this issue in the upcoming months). Furthermore, all pilot countries agree on some kind of national registered energy experts who will be able to proceed with SRI evaluations. Non-residential buildings were highlighted as appropriate for pilot assessing. Regarding technical domains and weighting factors modifications, the gained feedback differs a lot. Some countries stressed that climate zone should be distinguished even within the country (Croatia, Spain) and should be different for each building types (Croatia, Greece, Romania and partly Czech Republic).
Evaluation	

SRI Decision Support Tool

Country(s)	Bulgaria, Latvia, Czech Republic, Romania, Greece, Croatia, Spain, Austria
Source (project info links)	https://srienact.eu/sri-enact-tools/
Contact details	Stamatia Rizou: srizou@singularlogic.eu
EPBD Recast	Articles EPBD-15, EPBD-24, EPBD-17, EPBD-6
Problem/Motivation	Complexities in assessing SRIs for buildings in various scenarios, considering energy efficiency measures and technology adoption preparing the training of SRI auditors.

Short description of practice as implemented	The SRI-ENACT decision support tool will enable the evaluation of SRI in different scenarios, considering the potential adoption of energy efficiency measures and technologies. It will provide quantified assessments of different scenarios by estimating the impact of proposed measures in the SRI and the associated financial costs and required investments. Thus, the proposed solution will support informed decision making for building users/owners (incl. tenants), facility managers, energy auditors and other relevant stakeholders during the construction and renovation of buildings.
Evidence on impact	SRI-ENACT solution will be assessed in 1200 different types of buildings across EU.
Lessons learnt / recommendations for large-scale roll-out:	
Policy measures required for large-scale deployment	
Evaluation	

Training and Capacity Building for SRI Auditors in SRI-ENACT

Country(s)	Bulgaria, Latvia, Czech Republic, Romania, Greece, Croatia, Spain, Austria
Source (project info links)	https://srienact.eu/sri-enact-tools/
Contact details	Stamatia Rizou: srizou@singularlogic.eu
EPBD Recast	Articles EPBD-15, EPBD-25, EPBD-26
Problem/Motivation	The need for skilled professionals capable of accurately assessing buildings' SRI.
Short description of practice as implemented	SRI-ENACT provides a comprehensive training package, including guidebooks and capacity modules, for SRI auditors. This initiative aims to build a network of 120 trained auditors across 8 EU countries.
Evidence on impact	Training sessions, practical SRI test covering in total 130 different types of buildings.
Lessons learnt / recommendations for large-scale roll-out:	
Policy measures required for large-scale deployment	

Evaluation	

Stakeholder Engagement in Co-creation of SRI-ENACT Tools and Services

Country(s)	Bulgaria, Latvia, Czech Republic, Romania, Greece, Croatia, Spain, Austria
Source (project info links)	https://srienact.eu/sri-enact-tools/
Contact details	Stamatia Rizou: srizou@singularlogic.eu
EPBD Recast	Article EPBD-15, EPBD-30, EPBD-29
Problem/Motivation	Need for collaborative development of tools and services to support the uptake and implementation of SRI across varied EU Member States.
Short description of practice as implemented	Engaging a diverse group of stakeholders in the co-creation process for SRI-ENACT, leading to the design of tools and services that enable effective SRI assessment and smart readiness improvement in buildings.
Evidence on impact	SRI-ENACT solution will be assessed in 1200 different types of buildings across EU.
Lessons learnt / recommendations for large-scale roll-out:	
Policy measures required for large-scale deployment	
Evaluation	

Recommendations on introducing SRI into national regulation

Country(s)	Austria, Croatia, Cyprus, France, Portugal, Spain
Source (project info links)	https://ieecp.org/projects/sri2market/
Contact details	Dimitris Athanasiou: dimitris@ieecp.org
EPBD Recast	Article EPBD-15, EPBD-19
Problem/Motivation	Addressing regional disparities in SRI application and supporting Member States in integrating SRI into their national regulations to achieve energy and climate goals.
Short description of practice as implemented	Development of recommendations for each of the targeted Member States on: • integrating the SRI into the current national regulatory framework for buildings (including performance requirements and building certification schemes),

	• evaluating whether the default SRI calculation methodology is appropriate or whether adaptations are required, • using the SRI as an effective policy instrument to achieve the national energy and climate policy goals.
Evidence on impact	1200 buildings across 8 EU pilot countries will be implemented to fuel the interest of the national market actors in the SRI instrument.
Lessons learnt / recommendations for large-scale roll-out:	The interviewed energy stakeholders from all targeted MSs admit that the provisions of the EPBD, EED, Energy Market Regulation could benefit the deployment of SRI since they regulate the use of smart technologies, such as solar-ready buildings, smart-meters rollout, BACS, boosting DR and storage, that are essential for developing buildings' smartness, but at the same time SRI could facilitate the adoption of these smart technologies. Regarding the update of EPC and the integration of SRI into it, they insist that having two different certificates will be more complex and expensive for building owners and will hinder the successful roll-out of SRI. Updating EPC framework by integrating SRI into it is the most practical and efficient option, because both are based on information obtained through energy audits, they both provide information relevant to each other and will probably be carried out by the same professionals.
Policy measures required for large-scale deployment	
Evaluation	

Public Funding Schemes for SRI Upgrades

Country(s)	Austria, Croatia, Cyprus, France, Portugal, Spain
Source (project info links)	https://ieecp.org/projects/sri2market/
Contact details	Dimitris Athanasiou: dimitris@ieecp.org
EPBD Recast	Articles EPBD-15, EPBD-17, EPBD-18, EPBD-30
Problem/Motivation	The need to incentivise energy efficiency measures in buildings, reducing reliance on old polluting power generation plants, and addressing peak demand issues.
Short description of practice as implemented	SRI2MARKET proposes public funding schemes to finance SRI upgrades. The project facilitates stakeholder dialogue to define how improvements in SRI rating should be compensated, aiming to incentivise the building renovation market.
Evidence on impact	1200 buildings across 8 EU pilot countries will be implemented.

Lessons learnt / recommendations for large-scale roll-out:	
Policy measures required for large-scale deployment	
Evaluation	

SRI2MARKET Tool Suite

Country(s)	Austria, Croatia, Cyprus, France, Portugal, Spain
Source (project info links)	https://ieecp.org/projects/sri2market/
Contact details	Dimitris Athanasiou: dimitris@ieecp.org
EPBD Recast	Article EPBD-15, EPBD-18
Problem/Motivation	
Short description of practice as implemented	Tools will guide SRI assessors and streamline building assessments.
Evidence on impact	1200 buildings across 8 EU pilot countries will be implemented to test the SRI assessment process under real life conditions.
Lessons learnt / recommendations for large-scale roll-out:	
Policy measures required for large-scale deployment	
Evaluation	

Automated SRI Calculation and Machine Learning Services

Country(s)	Greece, Cyprus, Italy, Spain, Austria, Ireland, Netherlands
Source (project info links)	https://www.easysri.eu/en
Contact details	Dimosthenis Ioannidis: djoannid@iti.gr
EPBD Recast	Article EPBD-15, EPBD-22
Problem/Motivation	The need for an effective and user-friendly platform for SRI calculation that incorporates energy efficiency and financial dimensions.
Short description of practice as implemented	easySRI offers a web platform for automated SRI calculation, integrating energy efficiency and financial aspects. It includes ML-

	based tools for performance evaluation and recommendations for smart upgrades. The platform will combine: • An SRI Calculation engine, • An SRI Wizard tool, • An SRI-to-energy efficiency tool, and • An easySRI Repository
Evidence on impact	Demonstration cases in six European countries. The selected project demonstration cases will allow a fine calibration of the tools to be developed, and a demonstration of the methodology adopted by easySRI, by enabling the validation of different building typologies in different climatic regions, substantiating also on a highly participatory community engagement, and strong SME participation, which can promote further the awareness and scalability of the proposed solutions.
Lessons learnt / recommendations for large-scale roll-out:	
Policy measures required for large-scale deployment	
Evaluation	

Advanced SRI Assessment and Ethical Conduct in TIMEPAC Project

Country(s)	Austria, Croatia, Cyprus, Italy, Slovenia, Spain
Source (project info links)	TIMEPAC Code of Conduct for Smart Readiness and Sustainability Rating, TIMEPAC case studies
Contact details	Leandro Madrazo Agudin – Project Coordinator leandro.madrazo@salle.url.edu
EPBD Recast	Articles EPBD-15, EPBD-25, EPBD-23, EPBD-24
Problem/Motivation	The need for unbiased, efficient, and sustainable approaches in SRI assessments to enhance building energy performance and sustainability.
Short description of practice as implemented	The TIMEPAC Code of Conduct introduces ethical principles, efficiency, and transparency in SRI assessments. It incorporates modern tools like Building Energy Models (BEMs) and Building Information Modelling (BIM), ensuring auditors are current with technology and best practices.
Evidence on impact	Various case studies in the project.

Lessons learnt / recommendations for large-scale roll-out:	• Site visit is essential for the effective and transparent SRI and sustainability rating. • Avoid conflicts of interest and never try to sell products or services. • Respect the privacy and confidentiality of the client's information. • The SRI and sustainability auditor supports the application of innovative tools such as Building Energy Models (BEMs) and Building Information Modelling (BIM). • The SRI and sustainability auditor supports long-term use of energy-management systems. • key element of efficient demand-side management (DSM) is the proper identification of controllable and uncontrollable loads. • Recommendations should be tailored to the specific building and its unique characteristics and needs. • Always be transparent about the methods and assumptions used during the SRI and sustainability rating. • The SRI and sustainability rating should be unbiased and objective, focused on providing accurate and reliable information. • Always try to understand operational practices about how the building is used and operated, including occupancy, operating hours, and behaviour of occupants. • The SRI and sustainability auditor must ensure that all collected data are accurate, reliable and relevant. • Before submitting an official report always discuss your findings with the client.
Policy measures required for large-scale deployment	
Evaluation	

Smart readiness and Life Cycle Analysis Integration

Country(s)	EU countries
Source (project info links)	https://www.smartlivingepc.eu/en/ D2.1 Asset methodology assessment in building level
Contact details	Borges Cruz cruz.borges@deusto.es
EPBD Recast	Article EPBD-7, EPBD-15
Problem/Motivation	

Short description of practice as implemented	LCA tools facilitate a holistic examination of a building's environmental footprint over its entire life cycle, from construction to end-of-life considerations.
Evidence on impact	
Lessons learnt / recommendations for large-scale roll-out:	
Policy measures required for large-scale deployment	
Evaluation	

Integration of SRI Indicators into next generation EPCs

Country(s)	Austria, Greece, Germany, Lithuania, Netherlands, Cyprus, Spain
Source	D^2EPC - DELIVERABLE D2.6 SRI Indicators for next generation EPCs v2
Contact details	Panagiota Chatzipanagiotidou: phatzip@iti.gr
EPBD Recast	Articles 15, 19
Problem/Motivation	Establishing the framework and scope of SRI's integration in the proposed dynamic digital EPC scheme of the D^2EPC web platform
Short description of practice	Research regarding coverage of SRI functionalities by the IFC based BIM models (IFC4) and scope of need of input data; development of SRI calculation sub module
Evidence on impact	Tool tested by all pilots (6 case studies)
Lessons learnt / recommendations for large-scale roll-out:	
Policy measures required for large-scale deployment	
Evaluation of policy measure	

Policy implications and national priorities

Country(s)	Greece, Cyprus, Italy, Spain, Austria, Ireland, Netherlands
Source (project info links)	Expected:

	D6.1 easySRI policy implications and national priorities report v1 (M18) D6.2 easySRI policy implications and national priorities report v2 (M36)
Contact details	Dimosthenis Ioannidis: djoannid@iti.gr
EPBD Recast	Articles EPBD-9, EPBD-15
Problem/Motivation	Define practical ways in which the findings of the easySRI project can be incorporated into existing European policies and initiatives as well as in support of national level priorities (EPC, Renovation Passport, Green Deal, etc.).
Short description of practice as implemented	The procedure consists of two main parts and their work steps: (1) SRI impact indicators are mapped to the EU policy framework and policy instruments to identify which SRI impacts are relevant to which specific policy frameworks, instruments, and initiatives; (2) National priorities and possible ways forward to translate SRIs into improvements for EU policies and initiatives are identified.
Evidence on impact	
Lessons learnt / recommendations for large-scale roll-out:	
Policy measures required for large-scale deployment	
Evaluation	

Training packages and guidance for certification

Country(s)	Greece, Cyprus, Italy, Spain, Austria, Ireland, Netherlands
Source (project info links)	Expected: D6.4 Training packages and guidance for certification v1 D6.5 Training packages and guidance for certification v2
Contact details	Dimosthenis Ioannidis: djoannid@iti.gr
EPBD Recast	Articles EPBD-26, EPBD-29
Problem/Motivation	Development of training and guidance to engineers, auditors, assessors etc. to be able to use the easySRI services and implement the principles of easySRI in buildings certification.

Short description of practice as implemented	A technical manual and training material will be drafted and delivered, addressed to SRI and EPC assessors
Evidence on impact	
Lessons learnt / recommendations for large-scale roll-out:	
Policy measures required for large-scale deployment	
Evaluation	

Preliminary evaluation of the Smart Readiness Indicator of existing buildings in the Italian building stock

Country(s)	Italy
Source (project info links)	https://www2.enea.it/it/ricerca-di-sistema-elettrico/accordo-di-programma-MiSE-ENEA-2019-2021/tecnologie/efficienza-energetica-e-risparmio-di-energia-negli-usi-finali-elettrici-degli-edifici Project info: Funding scheme: ACCORDO DI PROGRAMMA MISE-ENEA 2019-2021 Title: “Efficienza energetica e risparmio di energia negli usi finali elettrici degli edifici” WP3
Contact details	Biagio Di Pietra (biagio.dipietra@enea.it)
EPBD Recast	Article EPBD-15, EPBD-Annex IV
Problem/Motivation	To develop a preliminary analysis of the Smart readiness indicator in buildings representative of the Italian building stock in different scenarios (i.e., current state and after smart retrofit).
Short description of practice as implemented	The project developed an analysis of the existing residential building stock and the regulatory context regarding the building technical systems affecting the SRI. 8 representative residential buildings typologies were identified and characterised in terms of domains and smart functionalities. The standard SRI calculation methodology was used to derive the SRI in three scenarios: i) “as-is” (buildings in their current state); ii) “energy” (buildings retrofitted according to the current market trend) and iii) “smart

	energy" (same retrofits of the "energy" scenario but revised from a smart perspective).
Evidence on impact	It was possible to calculate an SRI value ranging from 0% to 23% for the building typologies ("as is" scenario). The results were then extended to the entire residential building stock using ISTAT (national statistical institute) data to estimate an average SRI value of the existing building stock of approximately 5.2%. From the simulation of "energy" and "smart energy" scenarios, it emerged that the average national SRI would be equal to 15.8% and 27.6%, respectively.
Lessons learnt / recommendations for large-scale roll-out:	n.a.
Policy measures required for large-scale deployment	n.a.
Evaluation	n.a.

Analysis, application and validation of the Smart Readiness Indicator calculation methodology in the Italian building context

Country(s)	Italy
Source (project info links)	https://www.csea.it/wp-content/uploads/RDS-docs/esperti/2023/All_E-Schema-Piano-RdS-2022-2024_2.0.pdf (Italian language) Project info: Funding scheme: ACCORDO DI PROGRAMMA MISE-ENEA 2022-2024 Title: "Progetto 1.5 "Edifici ad alta efficienza per la transizione energetica" WP4
Contact details	Biagio Di Pietra (biagio.dipietra@enea.it)
EPBD Recast	Article EPBD-15, EPBD-Annex IV
Problem/Motivation	There is a limited knowledge about the technical implementation of the SRI calculation in the national context. Most studies reported inconsistencies and methodological gaps in the calculation of the SRI, as well as subjectivity and problematic interpretation in the selection of relevant services for the calculation of the indicator. The SRI calculation methodology needs to be tailored to the specific national context.

Short description of practice as implemented	The project aims to: i) analyse the technical and regulatory framework regarding the SRI throughout Europe (i.e., research projects, new experiments and scientific studies, etc.); ii) develop an optimised SRI calculation methodology for the national building stock, iii) apply and validate the standard and optimised SRI calculation methodologies to a sample of buildings in the Italian building stock; iv) develop a preliminary format of SRI certificate; v) perform a preliminary analysis of the correlation between the energy performance of buildings (e.g., measured in Asset Rating and/or Operational Rating) and the SRI in the Italian context; vi) analyse costs to achieve higher SRI for existing buildings.
Evidence on impact	n.a.
Lessons learnt / recommendations for large-scale roll-out:	(The project is currently under development). The project expects to: i) gather indications on the technical and regulatory framework regarding the SRI throughout Europe, in order to identify a suitable implementation strategy in the Italian context; ii) consolidate the SRI calculation methodology, taking into account the peculiarities of the Italian building stock both in residential and non-residential buildings; iii) provide a very first analysis of the integration between EPC and SRI, as well as a preliminary assessment of the existing correlation between the two indicators in Italy; iv) make available a SRI format for the national testing phase; v) provide reference costs to improve SRI level in existing Italian buildings. All those results constitute basic technical evidence for a possible national implementation phase of the SRI.
Policy measures required for large-scale deployment	n.a.
Evaluation	n.a.

Conceptualisation of the benefits of building smartness from the perspectives of carbon-neutral energy system in the Smart-Ready Buildings project

Country(s)	Finland
Source (project info links)	https://www.aalto.fi/en/smart-ready-buildings
Contact details	Eerika Borgentorp (eerika.borgentorp@aalto.fi)
EPBD Recast	Articles EPBD-15, EPBD-12
Problem/Motivation	Measuring the benefits of the building smartness to achieve carbon emissions targets in the Nordics.

Short description of practice as implemented	This project has two primary objectives: • to explore, by utilising concrete real-life cases, how commercially viable "smart readiness" can be defined in buildings and cities in such a way that it supports the flexible utilisation of the resources in urban and energy networks. • to define from the customer's point of view the central drivers, which motivate the users to deploy the smart ready services and to improve the resource efficiency in buildings and cities and eventually improve customer experience and create new business opportunities.
Evidence on impact	n.a.
Lessons learnt / recommendations for large-scale roll-out:	Differences have been highlighted between the Nordic power market and the SRI's baseline design. The highest level of smartness does not necessarily lead to reduced carbon emissions. The climate mitigation implications – one of the main drivers behind the SRI rating system's development work – are not fully fulfilled in the Nordics. [1] Identified benefits related to: • Benchmarking • Financial benefits • Energy saving • Practical suggestions for smart retrofits • Standardisation[2] Identified threats related to: • SRI assessors (will be they able to suggest practical smart retrofit interventions?) • SRI to be only a mandatory "piece of paper"? • increased expenses in building assessment • possibilities in reaching high SRI in old existing buildings (old buildings depreciation)[3]
Policy measures required for large-scale deployment	Considering building type when assessing the SRI Suggested the creation of a country specific assessment spreadsheet
Evaluation	n.a.

Policy context for the SRI

Country(s)	Austria, Croatia, Cyprus, France, Portugal and Spain

[1] https://iopscience.iop.org/article/10.1088/1755-1315/1101/2/022010/pdf

[2] https://aaltodoc.aalto.fi/server/api/core/bitstreams/8ce4b1b9-c337-45b9-9115-98e82369e14d/content

[3] https://aaltodoc.aalto.fi/server/api/core/bitstreams/8ce4b1b9-c337-45b9-9115-98e82369e14d/content

Source (project info links)	https://ieecp.org/projects/sri2market/ 10052024_SRI2MARKET_-DELIVERABLE_D2.1_FINAL.pdf (ieecp.org)
Contact details	Dimitris Athanasiou: dimitris@ieecp.org
EPBD Recast	Articles EPBD-9, EPBD-15
Problem/Motivation	Smartness of buildings was recently identified as a new approach to enhance buildings' performance, mitigate peak demand, increase demand's flexibility and ultimately decrease the carbon footprint of the building sector.
Short description of practice as implemented	The overall objective of this practice is to investigate how ready and able are the targeted MSs, namely Austria, Croatia, Cyprus, France, Portugal and Spain, to integrate SRI into their national regulation, what actions are taken to this end and what are their future plans for the utilisation of SRI.
Evidence on impact	1200 buildings across 8 EU pilot countries will be implemented.
Lessons learnt / recommendations for large-scale roll-out:	The interviewed energy stakeholders from all targeted MSs admit that the the provisions of the EPBD, EED, Energy Market Regulation could benefit the deployment of SRI since they regulate the use of smart technologies, but at the same time SRI could facilitate the adoption of these smart technologies. Regarding the update of EPC and the integration of SRI into it, t having two different certificates will be more complex and expensive for building owners and will hinder the successful roll-out of SRI. Updating EPC framework by integrating SRI into it is the most practical and efficient option, because both are based on information obtained through energy audits, they both provide information relevant to each other and will probably be carried out by the same professionals. It should integrate more detailed climate information, be tailored to each country's particularities and make the selection of service levels less dependent on assessors' perspective. To ensure the successful implementation of an SRI scheme, each MS has to conduct a thorough training of the assessors on how to use the SRI assessment methodology and on the material of the service catalogue and its levels.
Policy measures required for large-scale deployment	
Evaluation	A multi-method approach that included a preliminary participatory workshop with national stakeholders on "Progress so far and expectations from SRI", desk research on the policy context at the

	EU and national levels, consultation with national stakeholders and a SOAR analysis of the SRI instrument for the targeted countries, was conducted.

E-learning program on SRI assessments

Country(s)	Austria, Croatia, Cyprus, France, Portugal, Spain
Source (project info links)	https://ieecp.org/projects/sri2market/
Contact details	Dimitris Athanasiou: dimitris@ieecp.org
EPBD Recast	Articles EPBD-15, EPBD-26, EPBD-27
Problem/Motivation	The lack of standardised vocational training materials in multiple languages hinders effective evaluation and improvement of smart readiness in buildings. Additionally, there is a need for practical, hands-on training that incorporates real-world examples to enhance understanding and competency in SRI assessments.
Short description of practice as implemented	• The SRI2MARKET project is implementing a comprehensive e-learning program aimed at providing training on SRI assessments. This program includes multilingual training materials covering various aspects of the SRI methodology, such as background information, assessment guidelines, and compliance requirements. The training materials will be delivered through a user-friendly online platform and incorporate both video tutorials and text documents. Practical examples and case studies are included to enhance learning and comprehension.
Evidence on impact	The implementation of the e-learning program is expected to have a significant impact on the competency and effectiveness of SRI assessors. By providing standardised training materials in multiple languages and incorporating practical examples, the program aims to improve the quality and consistency of SRI assessments conducted across different countries and regions (1200 buildings across 8 EU pilot countries will be implemented to test the SRI assessment process under real life conditions). Additionally, by engaging participants in hands-on learning activities and assessments, the program seeks to enhance their understanding and application of SRI methodologies in real-world scenarios. Overall, the e-learning program is anticipated to contribute to the advancement of sustainable renovation practices and the promotion of energy-efficient building solutions.
Lessons learnt / recommendations for large-scale roll-out:	

Policy measures required for large-scale deployment	
Evaluation	

SRI and SRI-ENACT Assessment Toolkit testing in Bulgaria

Country(s)	Bulgaria
Source	https://srienact.eu/first-testing-in-bulgaria/
Contact details	Stamatia Rizou: srizou@singularlogic.eu
LATER: EPBD Recast	Articles EPBD-15, EPBD-22
Problem/Motivation	Improving the SRI testing procedure, using the SRI Assessment Toolkit software.
Short description of practice	Preparation of the manual for registration and operation of the SRI-ENACT Assessment Tool for the auditors/users in the best possible way. The detailed catalogue of 54 intelligent control technologies introduced in the software is a significant contribution to speeding up the work of determining the levels of functional perfection of the building's technical systems (domains).
Evidence on impact	The first SRI and SRI-ENACT Assessment Toolkit testing in Bulgaria was successfully carried out by the BSERC auditors in February-March 2024 on four different functional building types in four cities – Sofia, Plovdiv, Lovech and Sandanski (Total SRI score 25.8% - 57.1%).
Lessons learnt / recommendations for large-scale roll-out:	
Policy measures required for large-scale deployment	
Evaluation of policy measure	

SRI assessment case study: GREEN POINT BUILDING in Austria

Country(s)	Austria
Source	https://srienact.eu/sri-assessment-case-study/
Contact details	Stamatia Rizou: srizou@singularlogic.eu
LATER: EPBD Recast	Articles EPBD-15, EPBD-22
Problem/Motivation	Assessment using the new online tool developed in line with the EU proposed SRI methodology, option B and obtaining information on the smartness of buildings.

Short description of practice	For the Green Point Building, implementation of smart technologies for optimal control of energy flows and flexibility services to the grid should significantly increase the SRI score, together with the possibility to install more RES in form of heat pumps to also allow higher comfort.
Evidence on impact	The GREEN POINT BUILDING assessed was built intelligently using basic intelligent technologies. It has high energy efficiency (reflected in the best SRI score of 35.5%), is almost self-sufficient, even without the latest technologies installed, and provides an excellent basis for improvements.
Lessons learnt / recommendations for large-scale roll-out:	
Policy measures required for large-scale deployment	
Evaluation of policy measure	

Adaptation of SRI methodology to specific regional and climatic characteristics

Country(s)	Greece
Source	https://srienact.eu/wp-content/uploads/2024/07/Paper-IISA-2024-SRI_clean.pdf
Contact details	Stamatia Rizou: srizou@singularlogic.eu
LATER: EPBD Recast	Articles EPBD-15, EPBD-22
Problem/Motivation	Adjusting the Smart Readiness Indicator methodological framework by adjusting the weighting factors of different domains based on the “energy balance” method.
Short description of practice	Utilizing open data and consumption patterns, the customized weightings are applied to a typical Greek single-family house to demonstrate the differences and underscore the importance of tailored assessments for extracting more accurate results compared to the “standard” methodology. The findings highlight significant improvements, especially in energy efficiency and occupant comfort functionalities, suggesting that tailored approaches can enhance the accuracy of SRI assessments. By aligning SRI calculations with regional and climatic specificities, stakeholders can better address the unique energy challenges and opportunities within their contexts, ultimately contributing to the broader goals of energy efficiency and sustainable development.
Evidence on impact	The case is based on a Single-Family House in Greece.

Lessons learnt / recommendations for large-scale roll-out:	
Policy measures required for large-scale deployment	
Evaluation of policy measure	

Application of method A to assess the readiness of buildings for intelligent solutions

Country(s)	Latvia
Source	https://srienact.eu/pilot-assessments-riga/
Contact details	Stamatia Rizou: srizou@singularlogic.eu
LATER: EPBD Recast	Articles EPBD-15, EPBD-22
Problem/Motivation	Collecting practical experience in assessing the readiness of buildings for smart solutions.
Short description of practice	The assessment of the readiness of buildings for intelligent solutions is carried out in order to assess the level of automation of building engineering systems and their components and the possibility of effective management of energy supply and air conditioning devices of the building. The method A is used to perform the tasks.
Evidence on impact	The activity includes 27 smart readiness assessment services and applies to existing residential buildings and small non-residential buildings. The first 5 assessments of the smart readiness of buildings were completed in June 2024 (Total SRI score 12.2% - 33%), and recommendations were prepared for improving the smart readiness of individual buildings.
Lessons learnt / recommendations for large-scale roll-out:	
Policy measures required for large-scale deployment	
Evaluation of policy measure	

Preliminary results of the SRI assessment of the first buildings in the Czech Republic

Country(s)	Czech Republic
Source	https://srienact.eu/preliminary-results-in-czech-republic/
Contact details	Stamatia Rizou: srizou@singularlogic.eu

LATER: EPBD Recast	Articles EPBD-15, EPBD-22
Problem/Motivation	SRI assessments using the SRI toolkit.
Short description of practice	Demonstration of strengths and weaknesses of the application of the Smart Readiness Indicator for Buildings. The first SRI assessments have shown some challenging areas where Czech buildings score low: energy flexibility and energy demand services, indoor air quality reporting, maintenance planning and benchmarking, and energy storage.
Evidence on impact	The SRI auditors assessed 5 buildings, various types, sizes, construction year and building typology: hospital building, 2 schools, family house and renovated office building (Total SRI score 3.4% - 47.6%).
Lessons learnt / recommendations for large-scale roll-out:	
Policy measures required for large-scale deployment	
Evaluation of policy measure	

Assessment of Smart Readiness Indicators in Spain

Country(s)	Spain
Source	https://srienact.eu/preliminary-results-of-smart-readiness-indicator-assessments-in-spain/
Contact details	Stamatia Rizou: srizou@singularlogic.eu
LATER: EPBD Recast	Articles EPBD-15, EPBD-22
Problem/Motivation	Conducting an assessment of the state of implementation of smart technologies in Spanish buildings.
Short description of practice	Analysing specific factors contributing to higher SRI scores and identifying common areas for improvement in Spanish buildings. This information will be important for building owners, policy makers and technology providers in shaping the future of smart buildings in Spain.
Evidence on impact	The assessments conducted by Veolia Spain's internal staff focused on four buildings in the Valladolid region, providing valuable information on the current state of integration of smart technologies in Spanish buildings. Three buildings scored between 26% and 29%, while one building achieved a notably higher score of 48.9%, reflecting more advanced smart features. The differences in scores highlight the varying state of implementation of smart technologies in Spanish buildings and underline the potential for

	improvement across the entire building stock, particularly in areas such as energy efficiency, automation and user comfort.
Lessons learnt / recommendations for large-scale roll-out:	
Policy measures required for large-scale deployment	
Evaluation of policy measure	

Assessment of Smart Readiness Indicators in Romania

Country(s)	Romania
Source	https://srienact.eu/pre-pilot-sri-assessments-in-romania
Contact details	Stamatia Rizou: srizou@singularlogic.eu
LATER: EPBD Recast	Articles EPBD-15, EPBD-22
Problem/Motivation	Conducting a preliminary assessment of the state of implementation of smart technologies in Romanian buildings.
Short description of practice	Analysis of factors influencing the energy efficiency of buildings as well as enablers for improvement in areas such as energy optimization, system automation and occupant comfort across Romania's building stock.
Evidence on impact	During the first cycle, ISPE's in-house auditor conducted pilot SRI assessments on 10 buildings across six diverse locations in Romania. Among the buildings assessed, the Penny Market commercial building, Brănești and the Clinical Emergency Hospital, C2 building, Craiova achieved the highest scores (SRI score 48.6%, 40% respectively). The SRI score for the remaining buildings ranged from 6.4% to 32.1%. The second cycle of SRI assessments will involve 110 different buildings across Romania.
Lessons learnt / recommendations for large-scale roll-out:	
Policy measures required for large-scale deployment	
Evaluation of policy measure	

SRI Observatory

Country(s)	Italy, Cyprus, Greece, Germany, United Kingdom, Romania, Bulgaria

Source (project info links)	https://www.smartsquare-project.eu/ https://sriobservatory.eu/
Contact details	info@cyric.eu
EPBD Recast	Article EPBD-15, EPBD-18
Problem/Motivation	
Short description of practice as implemented	The site to stay up-to-date on the latest Smart Readiness Indicator (SRI) policy developments at the EU level, track and compare national implementation statuses, and learn about the most relevant research advancements in building smartness.
Evidence on impact	
Lessons learnt / recommendations for large-scale roll-out:	
Policy measures required for large-scale deployment	
Evaluation	

Smart Square tools – Smart-Ready-Go; Smart Readiness Virtual Training Centre

Country(s)	Italy, Cyprus, Greece, Germany, United Kingdom, Romania, Bulgaria
Source (project info links)	https://www.smartsquare-project.eu/ https://www.smart-ready-go.eu/ https://smartreadiness-training.eu
Contact details	info@cyric.eu
EPBD Recast	Article EPBD-15, EPBD-18
Problem/Motivation	The European regulations establish several legal provisions on smart-ready buildings. Consequently, Member States must set requirements for the project specification and inspection of Building Automation and Control Systems (BACS) and implement the Smart Readiness Indicator (SRI) in their context
Short description of practice as implemented	The Smart Readiness Virtual Training Centre is an innovative online platform designed to provide comprehensive, well-structured, and interactive training on the Smart Readiness Indicator (SRI). It has been developed to help professionals assess and enhance the intelligence of buildings in terms of energy efficiency, digitalization, and sustainability. Smart-Ready-Go is a tool to calculate SRI. The smart readiness indicator rating depends on a building's capacity to accommodate smart-ready services.

Evidence on impact	
Lessons learnt / recommendations for large-scale roll-out:	
Policy measures required for large-scale deployment	
Evaluation	

6 Integration of Instruments

6.1 Summary – to follow

6.2 Practices

Use of Smart Readiness Indicator methodology for Integration in EPC schemes

Country(s)	Austria, Denmark, Estonia, Greece, Romania
Source (project info links)	https://x-tendo.eu/ X-tendo feature 1: smart readiness indicator (SRI) p. 9-21
Contact details	Lukas Kranzl – Project Coordinator Lukas.Kranzl@tuwien.ac.at
EPBD Recast	Articles EPBD-15, EPBD-19, EPBD-20
Problem/Motivation	The SRI is intended to raise awareness about the benefits of smart buildings, including energy efficiency, an optimised mix of various energy sources, user occupancy experience and grid flexibility. In addition, its implementation is expected to stimulate investments in smart building technologies and support the uptake of technology innovation in the building sector.
Short description of practice as implemented	The X-tendo project integrates the Smart Readiness Indicator (SRI) into EPCs, advancing building assessments in Europe. This integration enhances the visibility of smart technologies within European buildings, offering users, owners, and tenants a tangible way to assess and improve energy efficiency, indoor comfort, and adaptability while promoting renewable and flexible energy systems.
Evidence on impact	In-building tests in three countries: Romania, Greece, and Estonia through various building types, including single-family homes, multifamily homes, offices, and schools, were assessed using the SRI evaluation methodology.

Lessons learnt / recommendations for large-scale roll-out:	• Simplified method suitable for initial SRI implementation, cost-effective, and requires minimal training. • Large, high-energy-demand non-residential buildings may need a more detailed approach later. • Include three sub-indicators within SRI when integrated into EPC but not on the first certificate page. • Connect SRI and EPC recommendations to enhance user understanding. • In residential buildings, simplified method raises awareness of energy-saving automation and comfort benefits for homeowners.
Policy measures required for large-scale deployment	• Define national strategies for implementation as voluntary or mandatory schemes of the two methods depending on the building typology. • Test communications strategies of the indicators, to make them relevant for the end user.
Evaluation	

Cross-assessment of EPC

Country(s)	Spain, Croatia, Malta, UK, Slovenia, Greece, Poland, Bulgaria, Denmark, Austria
Source (project info links)	https://www.crosscert.eu/ CrossCERT
Contact details	Eva Suba: e.suba@klimabuendnis.org
EPBD Recast	Articles EPBD-27, EPBD-19, EPBD-22
Problem/Motivation	
Short description of practice as implemented	Cross-testing between the current energy certificates and the new approaches/concepts/initiatives and creating a public benchmarking database of test cases.
Evidence on impact	Cross-testing of 147 buildings in 10 European countries.
Lessons learnt / recommendations for large-scale roll-out:	
Policy measures required for large-scale deployment	
Evaluation	

Development and Implementation of a Digital Twin Framework for Building Performance Monitoring and Simulation

Country(s)	Denmark, Ireland, Spain, Greece, Switzerland

Source (project info links)	https://www.chronicle-project.eu/
Contact details	Leon Nielsen – Project Manager lnielsen@fcire.es
EPBD Recast	Articles EPBD-15, EPBD-12
Problem/Motivation	Traditional building management systems often lack real-time data and predictive capabilities, which lead to energy wastage and suboptimal building conditions. The Digital Twin mechanism aims to solve these issues by providing an accurate simulation of building performance based on real-time data.
Short description of practice as implemented	CHRONICLE's Digital Twin framework serves as the core for project activities, modelling and simulating building processes using real-time IoT data. Leveraging advanced thermal modelling and machine learning, it forecasts building conditions, mimics occupants' behaviour, and maintains accuracy through ongoing IoT data updates.
Evidence on impact	Through the CHRONICLE tools, Herning Social Housing in Denmark will assess all stages of the planned renovations, gain insights to building performance and environmental impact under different renovation scenarios and minimise the post-renovation mismatch between the predicted asset and operational rating, thanks to its human-centred digital twin.
Lessons learnt / recommendations for large-scale roll-out:	
Policy measures required for large-scale deployment	
Evaluation	

Development of a holistic and modular EPC methodology

Country(s)	Austria, Belgium, Finland, Germany, Greece, Spain
Source (project info links)	https://epanacea.eu/, ePANACEA – Methodology Evaluation (D5.4)
Contact details	contact@epanacea.eu
EPBD Recast	Article EPBD-16, EPBD-Annex I
Problem/Motivation	Need to develop more reliable, user-friendly, and cost-effective assessment process and certificate, and be compliant with EU legislation in order to instil trust in the market.

Short description of practice as implemented	The practice entailed the possible implementation of advanced occupant models into the assessment methods developed under the ePANACEA.
Evidence on impact	• The project performed a comparison between the ePANACEA methodology consisted of three methods (M1, M2, M3) and the national EPC methodology. A total of 15 buildings was selected from 5 countries (AT, BE, FI, GR, ES). Differences between the various methods' outputs and the outputs derived from the current EPC were identified, as were the number and the quality of the outputs. The purpose was to perform a qualitative and quantitative cross-analysis of results in the pilot countries.
Lessons learnt / recommendations for large-scale roll-out:	• M1 is easy to implement and complements the current EPC methodology. • M2 utilises a monthly calculation basis provided by the standard 52016. • M3 uses an advanced & automated simulation modelling based on hourly calculations and its calibration procedures covering all the needs of the next generation of energy assessment and certification, and beyond.
Policy measures required for large-scale deployment	
Evaluation	

Use of Smart Readiness Indicator methodology into EUB digital passport

Country(s)	Austria, Croatia, France, Germany, Hungary, Ireland, Italy
Source	https://eubsuperhub.eu/
Contact details	Peter Gyuris - Project Coordinator coordinator@eubsuperhub.eu
EPBD Recast	Articles EPBD-15, EPBD-20, EPBD-19, EPBD-12
Problem/Motivation	Current EPCs don't provide data during the operation of buildings, new technologies (smart buildings), life cycle thinking (LCA, whole life costing…), or carbon footprint management. Furthermore, current EPCs don't assess a building in the field of sustainability and smartness. Current EPCs don't consider indoor environmental quality. The objective is to harmonise, improve, extend, and make reliable European EPCs.
Short description of practice	The final output of the EUB SuperHub project is the EUB e-passport (European Building electronic passport). It is noteworthy, that this EUB e-passport doesn't represent a renovation passport that provides a clear roadmap for staged deep renovation. The

	envisioned EUB e-passport assesses a building in the field of energy efficiency, sustainability and smartness built upon the EUB SuperHub digital building logbook (DBL) and based on the proposed system of 21 Key Performance Indicators (KPIs), establishing a comprehensive framework for achieving carbon neutrality in the building sector throughout a building's life cycle. The selected KPIs cover thematic areas such as energy consumption, renewable energy, GHG emissions, thermal comfort, indoor air quality, costs, smart buildings, resilience to climate change, E-mobility, and daylight sufficiency. On the list of the proposed system of Key Performance Indicators (KPIs) is KPI 18 – Smart Readiness Indicator.
Evidence on impact	The EUB Superhub project aims to implement 100 case studies to roll-out the next generation certification and EUB e-passport as the final output of the EUB SuperHub project.
Lessons learnt / recommendations for large-scale roll-out:	
Policy measures required for large-scale deployment	
Evaluation of policy measure	
Country(s)	Austria
Source	https://www.mdpi.com/1996-1073/13/13/3507
Contact details	Doris Österreicher doris.oesterreicher@boku.ac.at
Article	Extending the Application of the Smart Readiness Indicator–A Methodology for the Quantitative Assessment of the Load Shifting Potential of Smart Districts
Problem/Motivation	The current proposals for the SRI focus mainly on qualitative appraisals of the smartness of buildings and do not include the wider context of the districts
Short description of practice	To optimize infrastructure decisions on a larger scale, a quantifiable perspective beyond the building level is necessary to evaluate and leverage the larger load shifting capacities. This article builds on a previously published methodology for smart buildings with the aim to provide a numerical model-based approach on the assessment of whole districts based on their

	overall energy storage capacity, load shifting potential and their ability to actively interact with the energy grids. It also delivers the equivalent CO2 savings potential compared to a non-interactive system. The methodology is applied to theoretical use cases for validation. The results highlight that the proposed quantitative model can provide a meaningful and objective assessment of the load shifting potentials of smart districts.
Evidence on impact	
Lessons learnt / recommendations for large-scale roll-out:	
Policy measures required for large-scale deployment	
Evaluation of policy measure	

Country(s)	Austria
Source	https://www.mdpi.com/1996-1073/12/10/1955
Contact details	Doris Österreicher doris.oesterreicher@boku.ac.at
Article	Supporting the Smart Readiness Indicator—A Methodology to Integrate, A Quantitative Assessment of the Load Shifting Potential of Smart Buildings
Problem/Motivation	Simplified methodology for quantitative assessment of the load shifting potential of buildings
Short description of practice	The methodology is to provide a numerical, model-based approach, which allows buildings to be categorized based on their energy storage capacity, load shifting potential and their subsequent interaction with the grid. A key aspect is the applicability within the Energy Performance Certificate (EPC) in order to provide an easy to use calculation, which is applied in addition to the already established energy efficiency, building services and renewable energy assessments. The developed methodology is being applied to theoretical use cases to validate the approach.

Evidence on impact	
Lessons learnt / recommendations for large-scale roll-out:	
Policy measures required for large-scale deployment	
Evaluation of policy measure	

Country(s)	Austria
Source	
Contact details	Ralf-Roman Schmidt, ralf-Roman.Schmidt@ait.ac.at
Article	Digitale Energieplanung und Optimierung Urbaner Regionen
Problem/Motivation	Digital information models (DIM) are playing an increasingly important role in planning and decision-making processes and in optimising the operation of cities, districts and buildings, from building information modelling (BIM) to urban information modelling (UIM).
Short description of practice	digital information models for feedback about the real building energy efficiency in real time, the coordination of different stakeholder interests and technical variants through the integration of calculation and simulation tools and the facilitation of an iterative comparison of the planning processes for the grid, heat sources and buildings, including the automated consideration of urban planning requirements.
Evidence on impact	
Lessons learnt / recommendations for large-scale roll-out:	
Policy measures required for large-scale deployment	
Evaluation of policy measure	

Guidelines for EPC enhancement at EU level through TIMEPAC Academy

Country(s)	Austria, Croatia, Cyprus, Italy, Slovenia, and Spain
Source (project info links)	https://timepac.eu/ D4.9 https://timepac.eu/reports/guidelines-for-epc-enhancement-at-eu-level-through-timepac-academy/
Contact details	Leandro Madrazo Agudin – Project Coordinator leandro.madrazo@salle.url.edu
EPBD Recast	Articles EPBD-19, EPBD-8, EPBD-16, EPBD-22
Problem/Motivation	Lack of combining diverse activities related to building energy assessment (energy auditing, energy performance certification, and smart and sustainability rating) and data integration, including the use of energy consumption data and sensor technology, with the objective of achieving a more accurate and dynamic representation of a building's performance. Furthermore, enhancing interoperability through the integration of Building Information Modelling (BIM), Building Energy Modelling (BEM) and Renovation Passports (RP) is critical to creating a seamless and cohesive approach to building energy management across Europe.
Short description of practice as implemented	This practice provides a strategic framework that addresses key areas such as data integration, interoperability, and the inclusion of smart readiness and new sustainability indicators to modernize EPCs and enhance their functionality. This practice supports the adoption of dynamic, data-driven approaches to building energy management across Europe and outline a strategic framework for modernizing Energy Performance Certificates (EPCs). Key focus areas include data integration, interoperability, and the inclusion of smart readiness and sustainability indicators. By leveraging technologies such as Building Information Modelling (BIM), Building Energy Modelling (BEM), Renovation Passports (RP), and data integration,
Evidence on impact	TIMEPAC Academy, envisioned as a long-term hub connecting project partners beyond the project's lifetime. The Academy will serve as a centre for continuous learning, training, and knowledge sharing, supported by research and technological development partners, technology providers, and certification bodies. In this capacity, the TIMEPAC Academy will facilitate ongoing education, dialogue, and collaboration, contributing to the enhancement of EPCs at both national and EU levels. By acting as a central point of engagement, the Academy will ensure that the knowledge developed during the TIMEPAC project continues to influence EPC enhancement, foster the integration of new technologies, and drive forward the adoption of dynamic, data-driven energy performance assessments.

Lessons learnt / recommendations for large-scale roll-out:	TIMEPAC proposes a combination of energy certification activities, including energy audits, smart readiness assessments, and sustainability ratings, backed by integrated data solutions. This approach enables a more accurate, dynamic, and comprehensive assessment of building performance, moving beyond traditional, static certification methods. However, several challenges to EPC enhancement have been also identified, namely the integration of operational data, ensuring interoperability between different data systems and the incorporation of smart and sustainability indicators. Recommendations include improving data exchange standards, promoting the use of open data formats, and addressing cost and complexity barriers to the wider adoption of the certification.
Policy measures required for large-scale deployment	The key findings and recommendations outlined in this practice align with the latest recasts of the Energy Performance of Buildings Directive (EPBD) and the Energy Efficiency Directive (EED), supporting the EU's broader goals of improving energy efficiency and sustainability in the building sector.
Evaluation	

Building Renovation Passports from enhanced EPC data

Country(s)	Austria, Croatia, Cyprus, Italy, Slovenia, and Spain
Source (project info links)	https://timepac.eu/ D3.3 https://timepac.eu/reports/report-on-building-renovation-passports-from-enhanced-epc-data/
Contact details	Leandro Madrazo Agudin – Project Coordinator leandro.madrazo@salle.url.edu
EPBD Recast	Articles EPBD-19, EPBD-8, EPBD-16, EPBD-22
Problem/Motivation	Lack of proper integration of EPC and Building Renovation Passports
Short description of practice as implemented	The evaluation and verification of energy-saving opportunities based on EPC highlighted the importance of calculating savings in BRPs based on actual building usage.
Evidence on impact	Workshops with representatives from Austria, Croatia, Cyprus, Italy, Slovenia, and Spain to gather their feedback. Recognizing the challenges of expecting one individual to cover all aspects of the BRP, there is a call for a national training programme to bolster expertise in this area.
Lessons learnt / recommendations for large-scale roll-out:	Need for a broader utilization of Building Information Modeling (BIM) in building renovation endeavours. However, significant challenges emerged, notably the absence of a centralized BIM model database and the imperative for designated institutions to oversee data accuracy within these databases. Economic justifications for

	generating Energy Performance Certificates (EPC) and building Renovation Passports (RP) for low-energy-consumption buildings were also scrutinized. The necessity of implementing enhanced automatic checks for data entry to enhance EPC data quality, considering factors such as occupants' influence and other variables impacting data accuracy. Suggestions included expanding EPC coverage to non-residential buildings and incorporating additional indicators such as post-scenario CO2 emissions and investment assessments. There is a clear demand for comprehensive planning tools capable of integrating data and strategic planning across various governance levels.
Policy measures required for large-scale deployment	The lack of standardized regulations across countries was underscored, prompting recommendations for streamlining EPC procedures and incorporating advancements in technology and climate considerations, alongside intensified training for EPC issuers.
Evaluation	

Integration roadmap of SRI into EPC

Country(s)	Italy, Cyprus, Greece, Germany, United Kingdom, Romania, Bulgaria
Source (project info links)	https://www.smartsquare-project.eu/ D2.1 https://www.smartsquare-project.eu/wp-content/uploads/2023/11/SMART2_D2.1_v2.0.pdf
Contact details	info@cyric.eu
EPBD Recast	Article EPBD-15, EPBD-18
Problem/Motivation	SRI implementation has encountered challenges, particularly concerning data collection and integration with existing Energy Performance Certificate (EPC) calculation procedures. This is primarily because the information required for the issuance of an SRI certificate largely overlaps with the data collected for the EPC.
Short description of practice as implemented	This practice presents a comprehensive exploration of the Energy Performance Certificates (EPCs) and Smart Readiness Indicators (SRIs) in the context of building energy performance assessment. It addresses the need for alignment and integration between these two critical tools and identifies opportunities for enhancing their utilization in the building community.
Evidence on impact	

Lessons learnt / recommendations for large-scale roll-out:	Need for Integration: The demand for energy-efficient and smart buildings is growing rapidly. To meet this demand effectively, there is a compelling need to bridge the gap between EPCs and SRIs. These two tools, while distinct in their objectives, can complement each other to provide a more comprehensive assessment of building performance. ▪ Alignment Opportunities: We have identified numerous alignment opportunities between EPCs and SRIs. By integrating these tools, we can facilitate wider adoption, enhance calculation methods, and transform them into valuable decision-making tools for stakeholders in the building community. ▪ Overlapping Information: Our analysis has highlighted significant areas of overlapping information between EPCs and SRIs. Building orientation, heating and cooling systems, lighting, hot water systems, renewable energy sources, and climate data are common elements that both assessments require. Leveraging this overlapping data can streamline the assessment process and reduce duplication of efforts. ▪ Missing Information: While there is overlap, we have also identified areas where EPCs and SRIs lack critical information required for a comprehensive assessment. Notably, SRIs emphasize the functionality and integration of building automation and control technologies, which are not fully integrated into EPC methodologies. Addressing these missing elements is crucial for capturing the true potential of smart technologies in enhancing building energy efficiency. ▪ Utilizing Industry Foundation Classes (IFC): The utilization of IFC attributes for SRI calculations presents a promising avenue for enhancing data compatibility and extraction. By identifying gaps and proposing further development fields in ISO 16739-1:2018, we can better align IFC attributes with SRI requirements, improving the integration of this valuable resource. ▪ Parallel Layer of Information: The concept of a parallel layer of information, coupled with the development of an API for extracting required attributes from IFC documents, offers a practical approach to bridge the gap between EPCs and SRIs. This parallel layer can streamline data collection and analysis, ensuring that both tools benefit from a unified source of information.
Policy measures required for large-scale deployment	
Evaluation	

SRI integration roadmap to digital building logbooks

Country(s)	Italy, Cyprus, Greece, Germany, United Kingdom, Romania, Bulgaria
Source (project info links)	https://www.smartsquare-project.eu/ D2.4 https://www.smartsquare-project.eu/wp-content/uploads/2023/11/SMART2_D2.4_v2.0.pdf
Contact details	info@cyric.eu
EPBD Recast	Article EPBD-15, EPBD-18
Problem/Motivation	Digital Building Logbooks (DBL) are common repositories for all building-related data, increasing transparency, trust and informed decision making. The SRI may becomet part of the data structure for DBLs at large. This has the potential to be an important lever for the uptake of the SRI, but there is also feedback from the current tender "development of a harmonised EU model for a Digital Building Logbook" to start with small steps with respect to what a DBL must contain or do or it can be possible to hinder or delay the adoption/uptake of DBLs.
Short description of practice as implemented	This practice provides short, useful information related to linking DBL and SRI concepts and processes. This practice considers how the SRI and DBL can be linked together both with respect to process and data structure. Definitions and the state of the art are provided for both fields, a series of frameworks and data structures are examined for consideration, and pathways for linking via the newly proposed EU DBL Semantic Model are investigated.
Evidence on impact	
Lessons learnt / recommendations for large-scale roll-out:	With respect to "linking" the DBL and SRI, two approaches/directions of communication are considered that in their most simple form are: 1) The results and/or data from an SRI assessment can be placed within the DBL and 2) Data within a DBL can be used to facilitate, accelerate or make more accurate an SRI assessment. These approaches likely relate to the type of method used for the SRI assessment of which there are three: (A) Simplified method, (B) Expert SRI assessment method and (C) In-use smart building performance method. Method C is in the early stages of development and work in Smart2 on DBL to SRI and SRI to DBL concepts can progress the body of knowledge in the field. Analysis from this report concludes that there is yet much work to do to link DBL and SRI concepts. The proposed EU DBL semantic model does not yet capture/define nearly all aspects related to the assessment of smart ready services and as such important and significant work must be done to progress beyond reporting the score of an SRI to a DBL as a % (value) or providing a document / the assessment worksheet to hang in a DBL. Next steps within this task and for

	version 2 of this deliverable will include a more detailed look at each smart ready service to recommend or develop directly reading / writing linkages.
Policy measures required for large-scale deployment	
Evaluation	

Joint EPC and SRI audit process

Country(s)	Cyprus, Finland, France, Germany, Greece, Italy, Netherlands, Romania, Spain, Sweden
Source	
Contact details	SmarterEPC - Sophie Dourlens-Quaranta sophie.dourlens@r2msolution.com
EPBD Recast	
Problem/Motivation	The lack of a standardised process for conducting both EPC and SRI audits in a unified way prompted the development of a joint procedure to streamline building assessments.
Short description of practice	The joint EPC and SRI audit process simplifies building certification by combining two evaluations into one. The goal is to reduce administrative overhead, minimize errors, and improve overall assessment efficiency, with the procedure being tested in over 200 buildings across 10 countries.
Evidence on impact	
Lessons learnt / recommendations for large-scale roll-out:	
Policy measures required for large-scale deployment	
Evaluation of policy measure	