



iEPB

iEPB Integrated EPB Assessments

Technical and Regulatory Framework Overview



Co-funded by
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About the iEPB project

iEPB develops a common European pathway for integrated EPB assessments by improving synchrony and interoperability through a common data model and a role-based web platform. Currently implemented for EPC, SRI and Renovation Recommendations, it is an open, scalable approach that can be applied to other building assessments.

Core outputs / Key Exploitable Results (KERs):

- **R1** iEPB schema (common data model);
- **R2** standalone SRI calculation application;
- **R3** iEPB web app;
- **R4** national policy recommendations for EPBD recast adoption;
- **R5** SEPAPTol2iEPB evaluation tool.

Target audience



National and regional authorities



Assessors and auditors



EPB assessment scheme operators



Stakeholders using EPB data



Software and platform developers

Key takeaways

The EPBD is increasingly shaping a digital, decarbonization-oriented building ecosystem. iEPB report D2.1 shows that cross-country comparability is often constrained not by the existence of standards, but by how data is structured and exchanged in practice.

The policy focus is expanding toward decarbonization, lifecycle carbon, renovation pathways and smart readiness.

Interoperability challenges are frequently driven by digital fragmentation (templates, registries, schemas, exchange formats).

Machine-readable, structured data can improve interoperability without harmonizing national calculation methods.

Introduction

This info-pack highlights the most relevant insights from **iEPB Deliverable D2.1**, which maps the EPBD context and compares EPC-related workflows **in Austria, the Netherlands and Spain**. It explains why interoperability challenges are increasingly driven by digital architecture and data structures, and how this baseline supports iEPB results (R1–R5).

Why this info-pack, and how D2.1 fits in iEPB

This info-pack summarises key findings from Deliverable D2.1 – “Transparent description of each national and EU technical methodology for EPB Assessment”. It provides a common overview of:

- mapping the **EU regulatory and standardisation context**,
- documenting key **national implementation differences** (AT/NL/ES), and
- highlighting the **digital ecosystem constraints** that affect interoperability.

The full deliverable is [available at this link](#).

How this info-pack supports iEPB outputs

This D2.1 baseline informs iEPB’s five Key Exploitable Results (KERs), spanning structured data, tools, workflows, policy guidance and evaluation.

KER	WHAT IT DELIVERS	TYPICAL USER
R1 iEPB schema	Common structured format for EPB assessments data exchange	Authorities, software vendors
R2 Standalone SRI calculation app	SRI Standalone tool, designed for easy integration into other assessment tools.	Assessors, tool developers
R3 iEPB web app	Role-based platform to collect, manage and share EPB assessments data	Assessors, end users, authorities
R4 Policy recommendations	Guidance to support implementation of EPBD recast	Authorities, agencies
R5 SEPAPTool2iEPB evaluation tool	Evaluation/QA tool enabling iEPB-format data transfer between tools	QA bodies, advanced users

EPBD trajectory and expanding scope

1.1 Regulatory trajectory toward decarbonized buildings

The EPBD has progressively evolved from a framework centred on improving operational energy efficiency into a comprehensive instrument aimed at full building-sector decarbonization, lifecycle carbon accountability, and digital interoperability. What began as a mechanism to reduce energy consumption now operates as a systemic governance structure covering emissions, renovation planning, smart technologies, and structured data exchange. Buildings are no longer treated merely as energy consumers but as strategic components within the European climate neutrality pathway, reflecting a shift from energy efficiency toward decarbonization and lifecycle carbon, and an increasing need for structured data exchange and interoperability.

The EPBD direction of travel is not only “better energy performance”, but a more digital and interoperable assessment ecosystem.

1.2 Foundations: EPCs and minimum requirements

The initial framework introduced Energy Performance Certificates (EPCs), minimum energy performance requirements, and regular inspections of heating and cooling systems. Member States were tasked with defining national methodologies for calculating integrated building energy performance. While this created a unified regulatory objective, it allowed substantial technical flexibility, and over time national approaches diverged in climatic assumptions, input parameters, and reporting structures—limiting comparability across borders.

A unified EPB objective still allows national methodological flexibility, which can reduce cross-country comparability over time.

1.3 Cost-optimal performance and NZEB standards

A structural reinforcement occurred with the introduction of cost-optimal benchmarking and the Nearly Zero-Energy Building (NZEB) standard. Minimum requirements became economically calibrated rather than purely technical thresholds, EPC issuance became mandatory in key real estate transactions, and independent control systems were introduced to safeguard quality. This phase consolidated the methodological backbone through coordinated CEN/ISO EPB standards, increasing consistency while maintaining national adaptability.

1.4 Digitalisation and smart integration (SRI)

Subsequent revisions shifted attention toward digitalisation and system intelligence. The Smart Readiness Indicator (SRI) was introduced to evaluate a building's capacity to optimise energy use through automation, respond to grid signals, and adapt to occupant needs. Building performance assessment expanded beyond static energy demand calculations to include operational flexibility, monitoring capability, and integration with smart technologies.

1.5 Zero-emission buildings and lifecycle carbon

The regulatory framework now defines Zero-Emission Buildings (ZEB) as the standard for new construction, eliminating on-site fossil fuel emissions and incorporating lifecycle Global Warming Potential (GWP) into performance assessment. The methodology extends beyond operational consumption to include embodied carbon from materials, construction, use, and end-of-life phases. This marks a decisive shift from energy efficiency compliance toward holistic climate performance governance.

The assessment scope is expanding from operational energy to include lifecycle impacts and embodied carbon.

1.6 Structural digital requirements

Digital architecture has become central to implementation. EPCs must follow harmonised templates, be machine-readable, and integrate into national databases. Renovation Passports provide structured, phased renovation pathways linked to performance data, while national renovation plans define measurable energy reduction trajectories and prioritise worst-performing buildings. Data exchange, traceability, and independent verification mechanisms ensure transparency and reliability within this increasingly digital ecosystem.

The assessment scope is expanding from operational energy to include lifecycle impacts and embodied carbon.

Standards and national flexibility

2.1 EPB standards and national flexibility

The technical backbone supporting this framework consists of the CEN/ISO EPB standards. These standards allow Member States to populate normative annexes with nationally defined climatic data, primary energy factors, occupancy assumptions, and system parameters. While subsidiarity ensures contextual relevance, it also produces structural divergence in how performance inputs and outputs are defined and reported across Europe.

EPB standards provide a common backbone, while national annexes keep assessments context-specific.

2.2 Divergent national implementations

Although Member States share core indicators such as primary energy demand expressed in kWh/(m²·year), implementation varies significantly. Climatic zoning, weighting factors for energy carriers, default schedules, reference building definitions, and energy class thresholds differ between countries. These variations are technically legitimate but create barriers to cross-border benchmarking and digital comparability.

Interoperability bottlenecks: where fragmentation really comes from

3.1 EPC software ecosystems and data infrastructure

National EPC ecosystems typically include accredited expert procedures, official calculation software, and centralised databases. However, database schemas, metadata structures, and export formats are not harmonised. Even when identical performance indicators are calculated, differences in structured representation prevent seamless interoperability between national systems and external tools. The fragmentation lies less in methodological rigor and more in digital architecture.

Comparable indicators can still be non-interoperable if data structures differ

3.2 Methodology versus data model

A crucial distinction must be made between calculation methodology and data model. The methodology determines how energy performance is calculated; the data model defines how inputs and outputs are structured, validated, stored, and exchanged. Harmonising national calculation rules would be complex and politically sensitive. Aligning structured data schemas, by contrast, is technically achievable and enables comparability without interfering with national autonomy.

Align data structures to improve interoperability without harmonising national calculation rules.

3.3 Structural sources of fragmentation

Digital fragmentation arises primarily from inconsistencies in structured representation. Divergent national annex choices and non-standardised EPC database schemas limit automated validation, traceability, and cross-border analysis. The absence of harmonised import/export protocols further constrains integration with financial tools, renovation platforms, and smart energy management systems.

Smart readiness, dynamic assessment and exchange formats

4.1 Smart readiness and system flexibility

The SRI introduces a dynamic performance dimension, assessing automation capacity, grid responsiveness, and occupant adaptability. It positions buildings as active nodes within energy systems, capable of demand-side flexibility and real-time optimisation. Implementing such functionality requires interoperable digital infrastructures capable of managing structured performance data consistently across platforms.

4.2 Dynamic assessment and the SEPAP tool

Beyond static asset ratings, dynamic assessment methodologies are emerging to bridge the gap between calculated and measured performance. The SEPAP tool represents a significant advancement, integrating design-stage calculations with operational data to create a continuous “EPC cycle”. It enables automatic calibration using measured energy data, improving alignment between theoretical calculations and actual building behaviour. By incorporating feedback loops, it reduces the performance gap and supports performance monitoring and optimisation beyond compliance.

Dynamic assessment helps bridge the gap between calculated and measured performance through a continuous “EPC cycle”.

4.3 Interoperability and digital exchange formats

The SEPAP tool supports structured data exchange through compatibility with simulation environments such as OpenStudio. Import and export capabilities allow integration with BIM workflows and third-party software ecosystems. The ability to exchange data in consistent, machine-readable formats is fundamental to scaling dynamic assessment approaches. Without standardised schemas, auto-calibration and performance feedback loops remain isolated innovations rather than integrated components of national certification systems.

Import/export enables interoperability with OpenStudio, BIM workflows and third-party tools.

4.4 From static certification to continuous performance governance

The system is moving from static compliance-based certification toward continuous, data-driven performance governance. Lifecycle emissions, smart readiness, digital renovation roadmaps, and dynamic calibration tools collectively redefine how buildings are evaluated and managed, making data-driven management more central.

4.5. Enabling a unified digital building ecosystem

The primary technical bottleneck is no longer the absence of calculation standards but the fragmentation of structured data architectures. Achieving interoperability through harmonised schemas, machine-readable outputs, and validated exchange formats is essential for integrating lifecycle carbon metrics, smart readiness evaluations, and dynamic performance tools into a coherent European building ecosystem. Only through such structural alignment can digital innovation fully support decarbonisation of the building stock.

Harmonised schemas and validated exchange formats are essential to integrate lifecycle carbon, SRI and dynamic tools at scale.

Conclusion

The EPBD trajectory increasingly depends on digital readiness: machine-readable outputs, interoperable exchange formats and robust data governance. D2.1 shows that while methodologies are underpinned by standards and national flexibility, the main practical barrier to comparability and re-use is often the fragmentation of structured data architectures. Addressing this “digital layer” is essential to enable interoperable EPB workflows and scalable quality assurance across Europe.

Next steps and resources

Depending on your role, you may want to explore the iEPB results that are currently available:

- **Data exchange / interoperability:** see [R1 iEPB schema](#) and [R3 iEPB web app](#)
- **Smart readiness assessment:** see [R2 Standalone SRI calculation app](#)
- **Full D2.1 deliverable:** [available at this link](#)
- **Further reading (context):** [How EPCs are shaping new developments in line with the EPBD](#)



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