TIMEPAC

Towards Innovative Methods
for Energy Performance Assessment
and Certification of Buildings

TIMEPAC
FACTSHEET

Exploring future scenarios for EPC enhancement:

Procedures and services for the integration of the SRI and environmental sustainability indicators in existing EPC tools

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TIMEPAC aims to modernize building certification practices according to the latest Energy Performance of Buildings Directive (EPBD) review. Through five future "Transversal Deployment Scenarios," we enhance certification by integrating diverse data sources like operational data and renewable energy production. We also merge energy performance certificates with other assessment instruments like the Smart Readiness Indicator (SRI) and sustainability metrics. Our focus includes improving EPC reliability using BIM technologies during renovations and utilizing EPC databases for decision-making in large-scale renovation programmes.

This scenario aims to link SRI and sustainability indicators with EPC. This involves determining information dependencies, creating an integration framework, evaluating feasibility within existing EPC schemes, exploring enhancement measures, and testing the framework with common data-collection methods for target audiences.

Revolutionizing EPCs: Integrating SRI and sustainability for smart renovation plans

The ambitious plans for increasing the share of renewable energy sources (RES) and improving energy efficiency in buildings require continuous improvement in policy and research for new and efficient implementation approaches and instruments. One innovative solution that has emerged in this context is the Smart Readiness Indicator (SRI). The SRI was introduced by the European Union in 2018 while amending the Energy Performance of Buildings Directive (EPBD) and its subsequent regulations (Delegated Regulation 2020/2155) and Implementing Regulation 2020/2156), triggering an optional implementation phase by the EU countries. Since buildings are a major source of energy consumption, the European Commission has created Level(s), a framework that provides a common language for assessing and reporting the sustainability of buildings in order to assist the building sector on the journey to net zero, from design to end of life for a range of stakeholders including sustainability professionals, asset designers, owners and investors, as well as policymakers and public authorities.

In order to explore the main barriers and opportunities for the integration of the SRI and selected sustainability indicators in existing EPC schemes, we tested their applicability through a broad set of well-targeted and real cases, featuring various locations, building types and climatic conditions. Our main motivation was to examine the following two challenges related to the enhancement of EPCs and the implementation of a continuous flow of data through the four stages of the EPC cycle (i.e. generation, storage, analysis, and exploitation):

→ **Data integration from various sources for more effective EPCs by considering the building as a whole.**

→ **EPC enhancement with a SRI and sustainability indicators to accelerate the creation of reliable, smart and sustainable renovation plans.**

Performed activities resulted in the identification of tailored and building-specific energy-efficiency and flexibility measures. At the implementation level, this represents a significant step forward in the accuracy and usefulness of EPCs.

Towards enhanced energy performance assessment: Integrating real consumption data and sustainability indicators in EPC generation

A key objective of the energy-performance assessment of buildings is to provide the necessary background on energy consumption, to support the extensive energy renovation of buildings and to enable informed and cost-effective decisions to be made. Our initial hypothesis was that additional indicators, in combination with real consumption data, will allow a more accurate assessment of a building's energy performance as they consider the actual usage patterns, unlike static data which might be based on assumptions or outdated usage patterns. Also, dynamic data can help to adopt measures aimed at improving the energy usage. For instance, it can be used to identify patterns and peak periods of energy consumption. This is especially important when analysing the impact of smart retrofits on potential energy savings and for identifying potential energy-flexibility measures.

In the context of generating and enhancing EPCs with the implementation of a SRI and selected sustainability indicators, the main challenge is how to incorporate all these positive elements without making the EPC generation process too complex and costly for the final users.

Current practices, where building related data are used only for single/dedicated purposes, are unsustainable and cannot result in an enhanced EPC. It is crucial to enable the interoperability between existing databases, previously developed models (like BIM or BEM), and past energy-audit reports. This combined information should be accessible to independent experts, such as energy and facility managers, energy performance certifiers, designers, and others, in a manner that enables the new EPC to build upon previous data.

Facilitating this information is key to achieve cost-effectiveness for the client. Understanding past performance is vital for identifying tailored and building-specific measures to improve both energy efficiency and flexibility.

All this brings us to the critical point for the future development of the EPC: the interoperability between different databases (e.g., cadastre database, geographical database, EPC database, thermal energy plant register, statistical database, operational data and utility database (Figure 1).

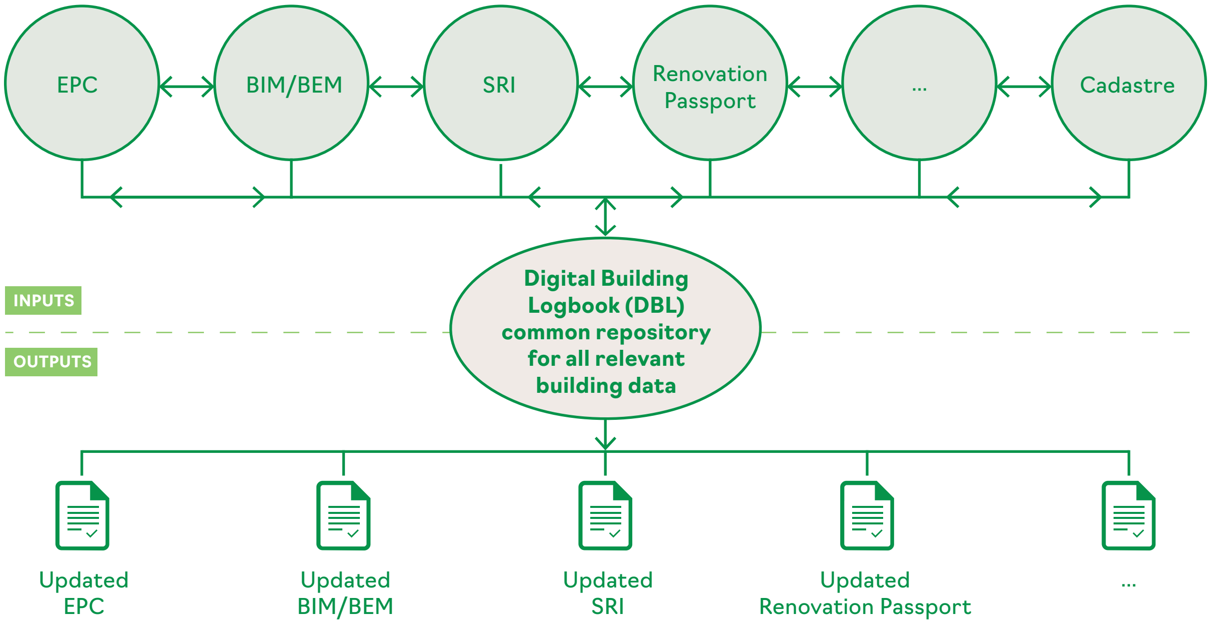

Figure 1: Digital Building Logbook as a central element of the future interoperability between different databases and envisaged dataflow

Assessing smart readiness and sustainability: Insights from multi-country building analysis and implementation of the TIMEPAC Code of Conduct

In order to assess the applicability of a SRI and sustainability indicators, a variety of buildings located in six partner countries (Austria, Croatia, Cyprus, Italy, Slovenia and Spain) were analysed. The selection includes buildings with different uses, sizes, energy performance, spatial and constructive characteristics, aiming to cover the diverse range present in the building stock. These buildings provided a real testing environment, including support of owners and maintenance staff and open access to the data necessary for the SRI and sustainability rating. The SRI and sustainability audits were carried out through a sequence of activities aimed at determining the current energy performance, level of smartness and sustainability, as well as identifying opportunities to improve performance and reduce costs. The SRI and sustainability auditing process followed the recommendations of EN 16247 – 1 and EN 16247 – 2.

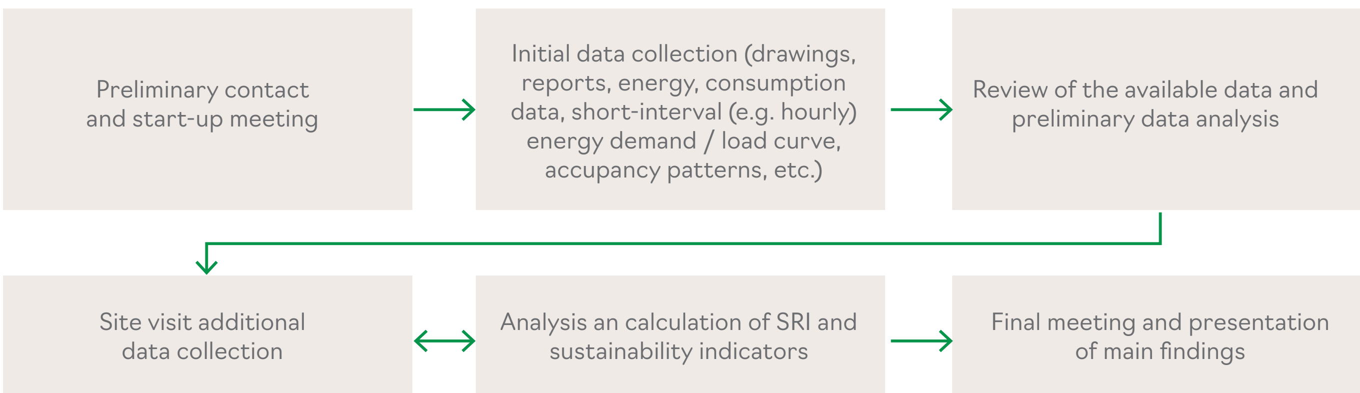

Figure 2: Main elements of the SRI and sustainability auditing based on EN 16247 – 1 (CEN, 2022a) and EN 16247 – 2 (CEN, 2022b)

The analysis of the data sources for the assessed buildings reveals variations in available sources from country to country. Across the assessed buildings, site visits and interviews with identified stakeholders were integral steps in the data collection process, as well as in the SRI and sustainability rating. This working procedure aligns with the current proposal of strengthened provisions on the EPC generation requirements, outlined in articles 16-19 and annexes V and VI[1] , which clearly state that the EPC is to be provided following an on-site visit.

During the SRI and sustainability auditing, experts provided comprehensive comments on the assessed systems and components. Proper interpretation of these comments in the context of overall SRI score and values of sustainability indicator values was crucial for identifying the energy efficiency and flexibility potentials. Based on these comments, energy efficiency and flexibility measures were identified and summarised in a so-called “smart-renovation scenario”. Figure 3 illustrates the total SRI score before and after the virtual implementation of “smart-renovation scenario” in selected buildings.

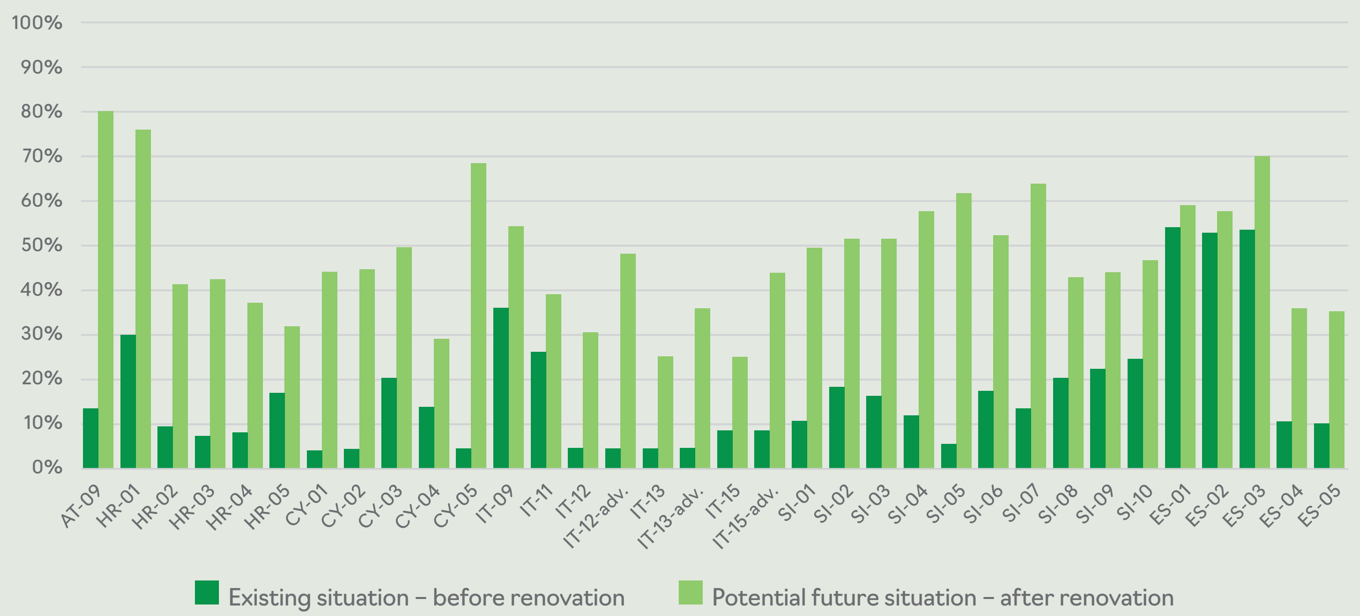

Figure 3: Total SRI score before and after renovation

1 Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on the energy performance of buildings (recast) - Analysis of the final compromise text with a view to agreement (Last accessed 16.2.2024; available at: https://data.consilium.europa.eu/doc/document/ST-16655-2023-INIT/en/pdf)

The relationship between total energy consumption (final energy) and SRI scores, before and after the implementation of the "smart-renovation scenario" for selected buildings in Croatia and Slovenia, is illustrated in Figure 4. It is evident that an improvement in the SRI also signifies an enhancement in the energy performance of the addressed buildings, as reflected in reduced total energy consumption.

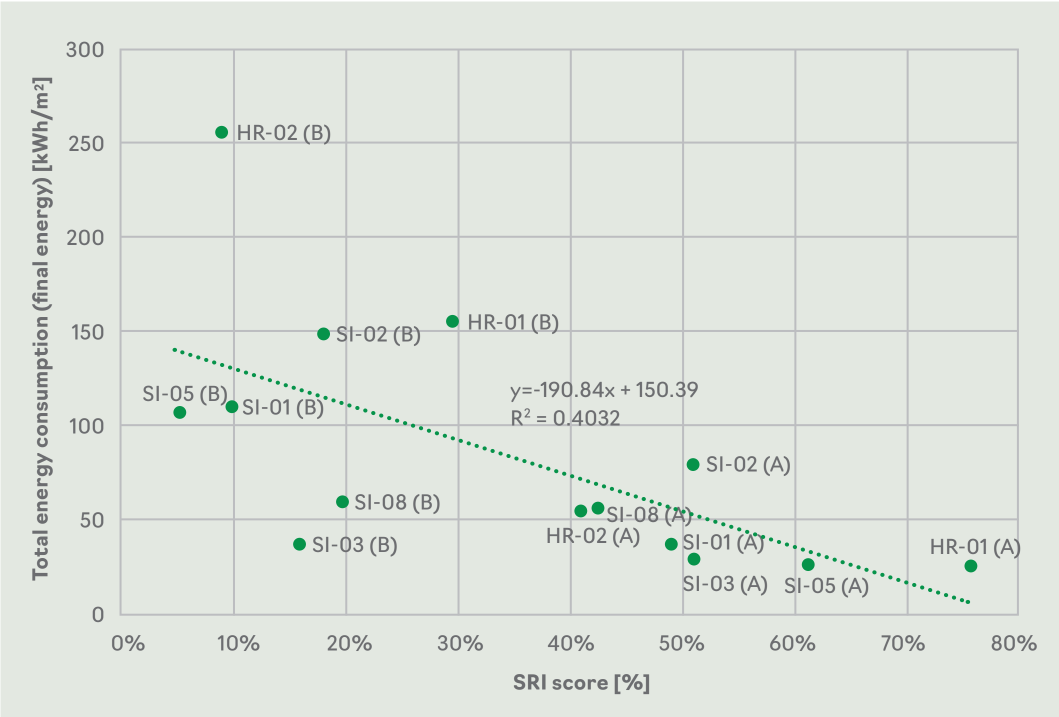

Figure 4: Relationship between total energy consumption (final energy) and SRI scores – case study Croatia and Slovenia

Regarding the sustainability rating, a comparison across the buildings from the six countries confirmed the usefulness and potential of the selected Level(s) indicators: use-stage energy performance, lifecycle Global Warming Potential (GWP), time outside of thermal comfort range and lifecycle costs (LCC).

The testing revealed that the selected four sustainability indicators from the Level(s) framework are linked to assessment methods that require data structuring that is different from current architectural practices. For instance, this is evident in the LCA study: even with a BIM available, the model may provide information about the general composition of building elements and their quantities, but lacks information on sub-element composition, such as the kg of brick per m^2 wall or the kg of cement mortar per m^2 wall. Default element compositions and related material quantities could assist practitioners. Additionally, better alignment between different tools (for example, EPC generation and LCA tools) could improve information flow. It is positive that experts can refer to several of the Level(s) macro-objectives and indicators when working on a renovation project, in order to limit the environmental impact of the intervention, to maximise the sustainability performance improvements and to prolong the lifespan of the building. However, it has to be emphasised that effectiveness of the SRI and the sustainability rating relies on competent technicians who require additional training on the assessment of a building's energy performance and the creation of sound recommendations for the reduction of energy consumption.

To promote the use of the SRI and sustainability indicators, the "TIMEPAC Code of Conduct for Smart Readiness and Sustainability Rating" has been created. It contains a set of guidelines, values and principles that deemed essential for the successful, professional, and transparent calculation of the SRI and selected sustainability indicators.

Outcomes

The SRI is a relatively new concept, and further testing and adaptations of the proposed methodology will be necessary before it can realize its full potential. One of the most valuable aspects of the tool is that it offers a common and reference language applicable at the EU level. This facilitates comparisons among experts and policymakers regarding progress in the smart readiness of the European building stock.

Lessons learned from the implementation clearly confirmed that to make the SRI and sustainability rating useful, specific and tailored recommendations for performance improvements must be provided to the final user. This means that to be cost-effective, the SRI and sustainability rating should be combined with energy auditing and energy-performance assessments. Based on the experiences derived from the actual SRI and sustainability auditing of selected buildings, we have also identified the key competences that SRI and sustainability auditors must have. Given the multidisciplinary nature of smart readiness and sustainability, these auditors often require a broad base of knowledge and expertise.

Special attention must be given to properly explaining the SRI score, which is now simply represented by a smartness percentage. The auditor should always strive to explain their findings with an emphasis on potential energy efficiency and flexibility improvement measures. To address this issue, we proposed the introduction of the Smart Performance Coefficient (SPC), a ratio of actual SRI to the benchmark SRI for the selected building type or the ratio of the predicted SRI after the implementation of the foreseen smart renovation scenario and the actual SRI. The purpose of the SPC is to enable a proper interpretation of the SRI value and to present that information to the building owner/ occupant in a simple and straightforward manner.

During the initial period of the SRI's implementation, the proposed approach will require continuous updates of the benchmark values since there is no operational definition for the expected benchmark value for the selected building type. Additionally, it is essential to properly address the high cost of smartness and develop a set of measures to promote and inform the public about the benefits of smart and flexible technologies. Without a proper understanding of the potential benefits of smart technologies and the active engagement of building owners, achieving the desired level of smartness in buildings and adapting to climate change will be unattainable.

For more detailed information, including the complete version of the "TIMEPAC Code of Conduct for Smart Readiness and Sustainability Rating", please refer to the report "Procedures and services for the integration of the SRI and environmental sustainability indicators in existing EPC tools - Transversal Deployment Scenario 4".

timepac.eu/reports/procedures-and-services-for-the-integration-of-the-sri-and-environmental-sustainability-indicators-in-existing-epc-tools/

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