TIMEPAC

Towards Innovative Methods
for Energy Performance Assessment
and Certification of Buildings

TIMEPAC FACTSHEET

Exploring future scenarios for EPC enhancement:

Enhancing EPC schemas through operational data integration

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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 assessments 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.

In this scenario, we have employed new methods and tools to enhance current EPC schemas through operational data integration.

Enhancing energy certification through dynamic approaches

The energy performance certificate (EPC), as defined by the upcoming Energy Performance of Buildings Directive (EPBD) recast, is a *"certificate recognised by a Member State or by a legal person designated by it, which indicates the energy performance of a building or building unit"*. It can be calculated with a methodology, *"which may be differentiated at national and regional level"*, but based on a common general framework and EU standards. It should include common indicators, but also additional ones such as *"metered energy consumption"*. Moreover, *"The methodology should ensure the representation of actual operating conditions and enable the use of metered energy to verify the correctness and for comparability, and the methodology should be based on monthly, hourly or sub-hourly time-steps"*.

In line with the spirit of the EPBD, the TIMEPAC project aims to improve current energy certification processes by transitioning from single, static certification to more holistic and dynamic approaches, which take into account the actual building performance including operational data.

This enhancement of current EPCs with operational data conveys expanding the set of energy performance indicators in the EPC to enable a more comprehensive building assessment, while improving the accuracy and reproducibility of the overall energy performance assessment procedures, and assessing the impact of advanced building technologies, such as Building Automation and Control Systems (BACS). This procedure, which is the base of TIMEPAC work, is described in Figure 1.

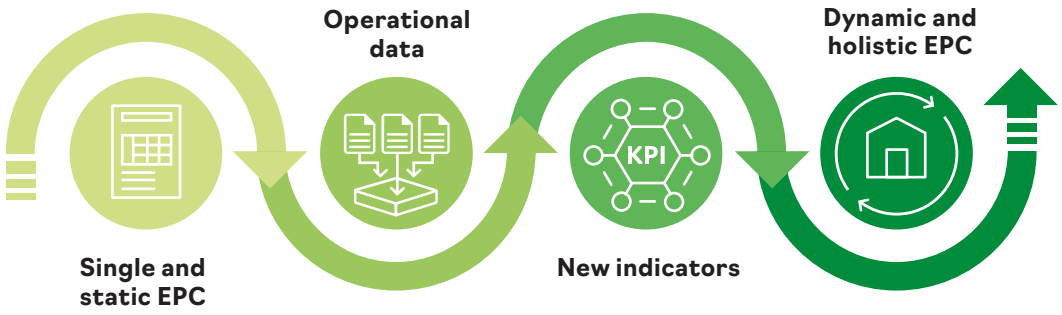
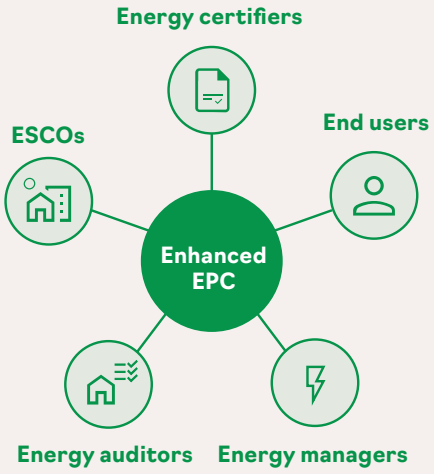


Figure 1: EPC enhancement with operational data

Unlocking the value of enhanced Energy Performance Certificates

An improved EPC could meet the current and future needs of those involved in building certification (Figure 2), offering valuable insights into both existing and new buildings.



Energy certifiers
New procedures to ensure the reliability of the EPC.

End users
- New indicators to assess in a holistic way the performances of a building from the perspective of buying/renting.
- Tailored procedures, able to evaluate the energy performance deploying the user's profile.

Energy managers
Use of the energy and economic indicators to assess possible improvements.

Energy auditors
New standardised procedures that can also be used in energy audits.

ESCOs
New economic indicators to assess the convenience of the energy efficiency measures and to plan possible investments.

Figure 2: Stakeholders involved and added value of an enhanced EPC

The current perception of the EPC is that it serves solely as a mandatory document, lacking any meaningful purpose beyond bureaucratic obligation. However, improvement in its accuracy, expansion of the information it offers across various domains, and the availability of results based on both standard data and user-specific inputs will increase its utility, transforming the EPC into a more valuable tool. This will enable end users to make more informed decisions about the building they own, they want to rent or purchase. On the other side, energy certifiers would be able to produce documents that clients will genuinely value, resulting in benefits for the overall building stock. Considering economic indicators in the certification process will offer valuable insights for Energy Service Companies (ESCOs) to evaluate potential investment strategies. An enhanced EPC incorporating economic data would allow ESCOs to gauge the feasibility of various energy conservation measures, taking into account the time value of money.

Likewise, energy managers could utilize the information within the EPC to evaluate potential enhancements for their buildings, taking into consideration both the needs of the users and the economic feasibility. In sum, enhanced EPCs would serve as a foundation for new certification procedures, thereby improving the consistency of energy auditors' work.

The process of enhancing the EPC schema

In accordance with Annex V of the most recent EPBD, the proposed enhancement of the EPC schema involved integrating operational data by introducing new key performance indicators (KPIs). These indicators were selected based on the outcomes of various analyses conducted on the chosen buildings. The process of enhancing the EPC schema with these new indicators and procedures involved the following analyses:

1. **Standard energy performance assessment (SEPA)**
2. **Tailored energy performance assessment (TEPA)**
3. **TEPA calibration against monitored data (CAL)**
4. **Economic evaluation of energy efficiency measures (ECMs)**
5. **Indoor environmental quality (IEQ) evaluation**
6. **Building Automation and Control System (BACS) impact assessment**

The workflow for the EPC enhancement, as presented in Figure 3, included the following steps:

- Analysis of the existing procedures for the assessment of the energy performance of the building to define guidelines for the collection of relevant data.
- Analysis of the existing procedures for building data analysis, including domains beyond energy (e.g., economic, comfort, etc.), to select useful ones and create application guidelines.
- Determination of new KPIs for implementation in the EPC schema (as either compulsory or optional) based on the analysed and selected methods.
- Conducting a building survey to identify a group of buildings for each partner country in the TIMEPAC project.
- Selection of the group of buildings for the application, based on available information and relevant building thermal features.
- Application of the proposed procedures for the enhanced EPC on the selected group of buildings.
- Analysis of the results in terms of easiness of application of the procedures and quality of the KPIs.

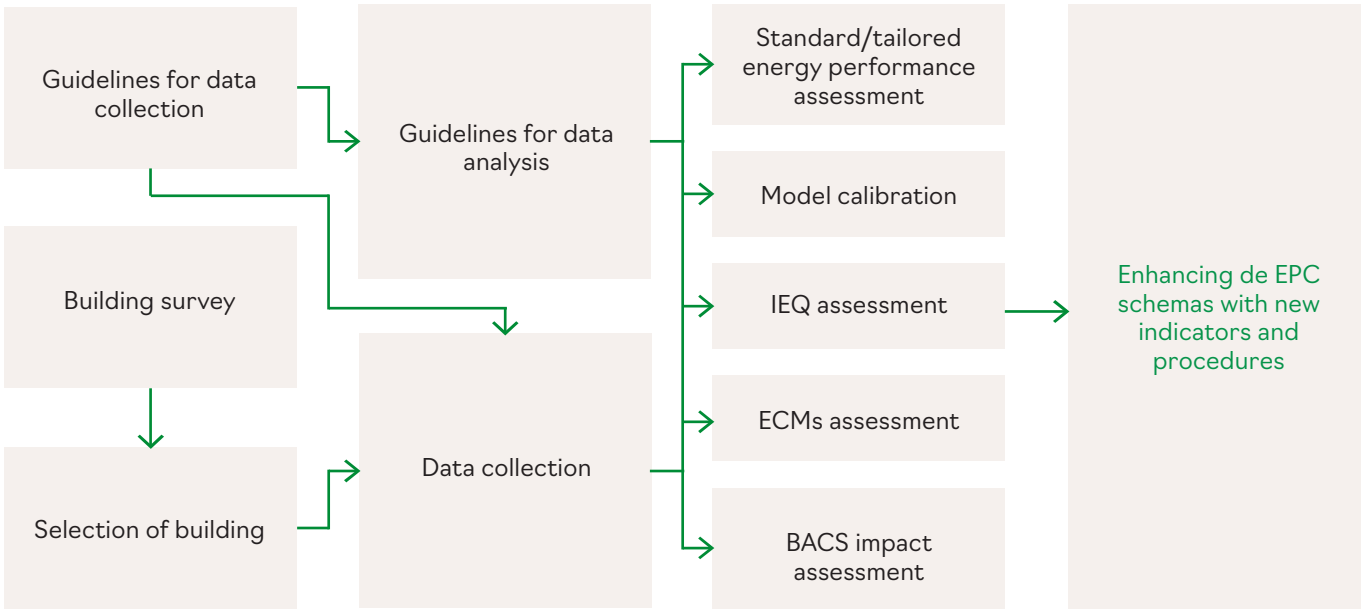


Figure 3: EPC enhancement workflow

Outcomes

The analyses conducted to enhance the EPC highlighted the advantages and disadvantages of the proposed procedures, while considering the specific certification conditions in the participating countries.

The TEPA relies on accurate data regarding actual occupancy and building usage, which can be challenging to obtain. Nonetheless, TEPA often shows significant differences from standard energy performance assessments, highlighting the advantages of its inclusion into EPCs.
The calibration procedure showed significant potential in reducing model inaccuracy and identifying possible model errors. The main issues of this method are related to its heavy dependence on measured data that may be difficult to find with sufficient accuracy and quantity. Also, depending on the original model complexity and the energy efficiency calculation process, the iterative calibration process could result in a significant increase in computational time.

Economic evaluations, based on discounted price assessments, proved simplicity and effectiveness in comparison to current procedures.

Conversely, evaluating indoor environmental quality faced limitations, especially concerning thermal comfort and air quality procedures, which are limited to hourly calculations and require country-specific adjustments due to enforceable national legislation. Nonetheless, despite these constraints, these procedures provide valuable information to final users.

The evaluation of BACS in buildings has proven to be a valuable tool. Presently, there is a notable lack of information on building control and automation systems in the EPCs of several countries. Acknowledging the fundamental role of BACS in evaluating building energy performance, it becomes imperative to introduce new indicators in EPCs to underline their significance and impact.

For more detailed information, please see the report "Enhancing EPC schemas through operational data integration – Transversal Deployment Scenario 2".

https://timepac.eu/reports/3168/

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