# TIMEPAC

**Towards Innovative Methods
for Energy Performance Assessment and Certification of Buildings**

Deliverable 5.8

# Proceedings of the TIMEPAC-23 International Workshop

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# Table of contents

# List of tables

# List of figures

# Executive Summary

This is a report of the TIMEPAC-23 International Workshop "Towards a dynamic and enhanced EPC: advanced procedures for building assessment and certification", organized by SERA global GmbH that took place on 21 November 2023 at the IG Architektur, Gumpendorferstraße 63B, Vienna, Austria.

The workshop was carried out as onsite event with one online-presentation and the possibility of online participation. The programme was structured in four sessions:

- **Session 1 - Using BIM for the EPC generation process.** Procedures used to obtain data from Building Information Modelling (BIM) for Energy Performance Certification (EPC) generation, while also delving into the benefits of utilizing BIM for creating the EPC.
- **Session 2 - Integrating data sources in renovation roadmaps.** Benefits of establishing linkages between EPCs, energy audits, logbooks, and Building Renovation Passports (BRPs) and how it can impact cost savings and reliable decision-making.
- **Session 3 - Enhanced EPC - integrating additional indicators, SRI, and BRP.** Advantages and challenges of integrating additional sustainability indicators such as Indoor-air quality (IAQ) and Smart Readiness Indicator (SRI).
- **Session 4 - Supporting the Renovation Wave.** Approaches to identify and track the implementation of renovation measures, to ensure that the decarbonisation of the building stock is achieved.

This document contains the programme of the workshop, the abstracts, a summary of the panel discussions and some concluding remarks on the four topics of the programme.

The presentations can be found on the project web page; a full recording of the workshop is available in a video.

# 1  Introduction

The overall objective of the TIMEPAC project "Towards Innovative Methods for Energy Performance Assessment and Certification of Buildings", is to foster the implementation of a more holistic approach to energy certification of buildings by considering:

> a. the overall cycle of EPC related data, from generation to storage, to analysis and exploitation, throughout the building lifecycle, from design, to construction and operation,
>
> b. that buildings are part of a larger ecosystem which includes energy and transport networks and the built environment, and
>
> c. that buildings are dynamic entities, continuously changing over time.

TIMEPAC workshops are vital elements of the project's communication and dissemination strategy. The TIMEPAC series of workshops began in 2019 and continued with three workshops held in Ljubljana (2021), Torino (2022) and Vienna (2023), organized by the Jožef Stefan Institute (JSI), the Politecnico di Torino (POLITO) and by SERA, Institute for Sustainable Energy and Resources Availability, respectively.

The objective of these workshops is to provide a platform for energy efficiency experts, researchers and those interested in learning about sustainability in the building sector, to present and exchange their experiences, results, research progress and to discuss the state of the art, as well as to determine the future directions and priorities in the various areas of energy performance of buildings. This includes the improvement and dissemination of knowledge on methods and indicators for energy performance assessment, policies for enhancing the deep renovation of buildings and technologies for increasing energy efficiency in the building sector, in economic, environmental, and social terms.

The TIMEPAC workshops cover the following areas:

- Formulation of a comprehensive energy policy framework for the deep renovation of EU building stock (potentials, models, and tools, costs, and benefits, financial and regulatory mechanisms, trends, and predictions, etc.),
- Methods for energy performance assessment comparisons and measurements methodologies,
- Deep energy renovation of buildings as a driver for innovation and the creation of employment,
- New trends and developments in modelling and energy performance certification of buildings,
- Smart energy services (technology development, knowledge transfer, installation, maintenance, national, regional, and municipal policies),
- Big data analysis,
- Energy communities, decarbonisation, and sector coupling (integration of infrastructure, new trends in planning future energy systems, integration of renewable energy heat/cold supply, highly efficient cogeneration, heat pumps, utilisation of excess heat and integration with district heating network, green hydrogen, etc.),
- Regional planning and cooperation,
- New trends in energy performance contracting and verification of energy savings,
- Education and training in energy efficiency and deep renovation of buildings,
- Urban planning and the integration of renewable energy sources in buildings,
- Smart energy networks and advanced storage systems in buildings.

The overarching theme of TIMEPAC-23 International Workshop was "Towards a dynamic and enhanced EPC: advanced procedures for building assessment and certification". The event took place in Vienna on November 21, 2023, with the option to participate online.

# 2  Workshop dissemination

The workshop was promoted at the project website as shown in Figure 1 and Figure 2 below. In addition, the workshop was promoted by the TIMEPAC communication team through the social media channels of TIMEPAC.



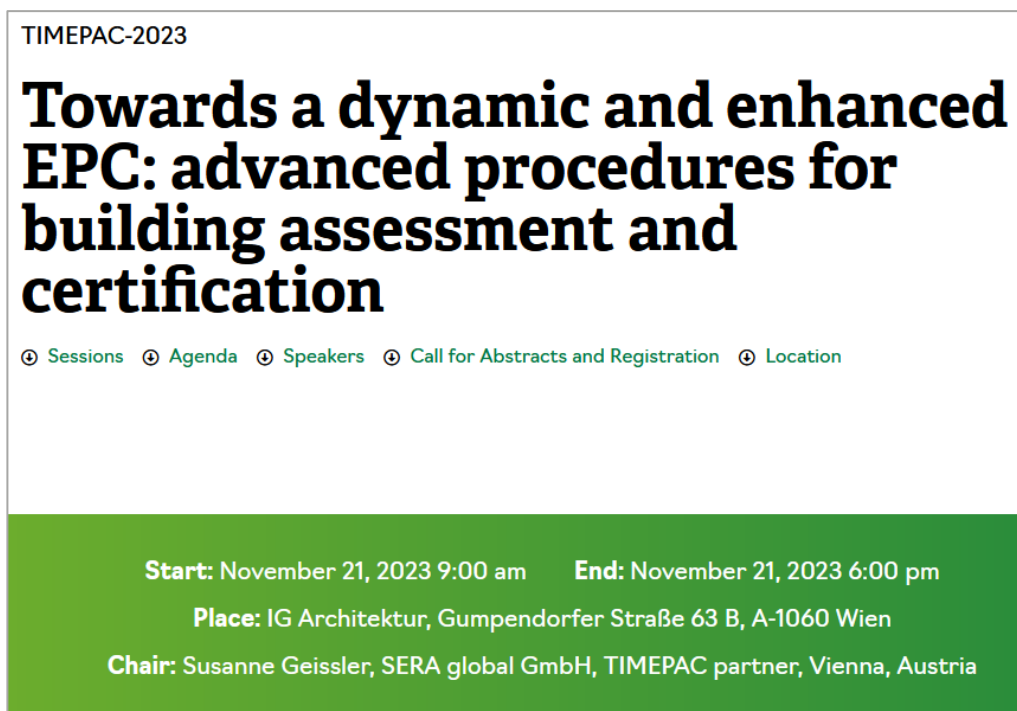**Figure 1.** Dissemination on the project website



**Figure 2.** Dissemination on the project website

SERA disseminated the workshop specifically to Austrian stakeholders, as shown in Figures 3, 4, and 5.

**Figure 3.** Promotion of the workshop at Österreichische Gesellschaft für Nachhaltiges Bauen



**Figure 4.** SERA Newsletter on 6 October 2023

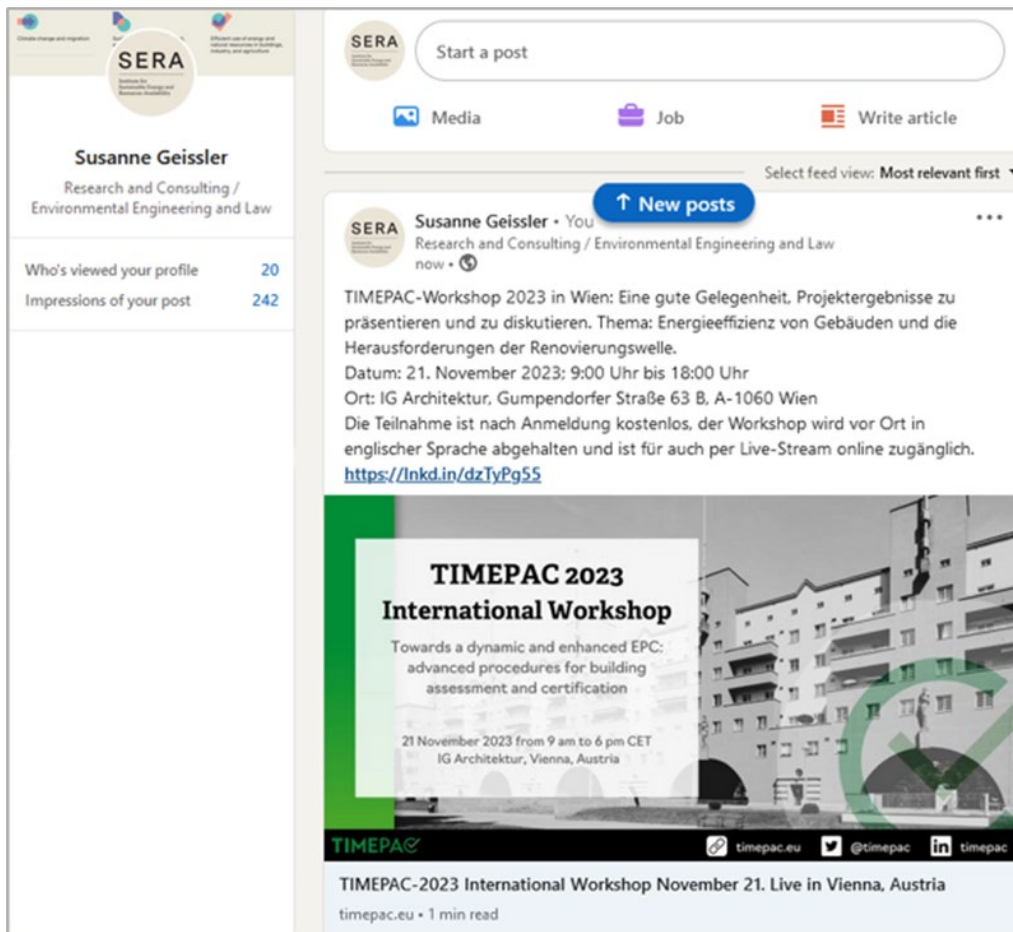**Figure 5.** SERA LinkedIn post on 5 October 2023

In addition, information about the workshop was distributed through SERA's partner organisations and their networks, including ÖGUT (Austrian Society of Environment and Technology), BEUC (Business Cluster for Construction, Energy and Environment), and DECA (Austrian Association of ESCOs), as well as through personal communication such as emails and phone calls.

# 3  Workshop programme

The EU Green Deal and the amended Energy Performance of Buildings Directive (EPBD) have prioritized the urgency of increasing building retrofitting rates. In this context, energy performance certification is expected to play a crucial role in the renovation of the European building stock.

Current Energy Performance Certificates (EPCs) are inexpensive but often suffer from low data quality and a lack of sufficient customization to match the actual building conditions. Additionally, their validity period of 10 years means they frequently fail to reflect the current status of the building. Overall, there is room for improvement in terms of market acceptance. However, there exists a clear trade-off between the cost of issuing a comprehensive and tailored EPC and customers' willingness to pay for it. Lastly, professional certifiers need training in methods and tools that enable them to deliver accurate and reliable certificates.

Nowadays, there are number of EU research projects which are working to improve existing energy certification processes by moving from single, static certification to more holistic and dynamic approaches. This workshop should offer an opportunity to exchange the results of these projects, facilitating continued progress towards more effective building certification processes. Hence, its primary purpose was to serve as a platform to share insights and outcomes regarding the anticipated changes in the energy performance certification within the context of the ongoing recast of the Energy Performance of Buildings Directive (EPBD).

After the introductory addresses, the workshop was structured into four sessions, with two in the morning and two in the afternoon. Each session commenced with a contribution from a member of the TIMEPAC team, followed by presentations from other participants. The session concluded with a panel discussion featuring all presenters. Moderators for the panel discussions were representatives from other projects, serving as experts in the respective fields they moderated.

The target audience comprised representatives from the private sector, public administration, academia, and research who are interested in the ongoing changes in building assessment and retrofitting, aligned with the goals of the European Green Deal.

The workshop, conducted on-site in English, was made accessible to the audience online through a live stream. It attracted a total of 65 participants, and participation was free of charge.

## 3.1 Agenda

| | |
|---|---|
| 8:00 | **Registration and technical set-up.** SERA Team |
| 9:00 | **Opening words** – Sylvain Robert, Project Officer, CINEA, European Commission<br><br>**Welcome and TIMEPAC Vision** – Leandro Madrazo, ARC Engineering and Architecture La Salle, Ramon Llull University, Barcelona, Spain |

**Session 1: Using BIM for the EPC generation process**

- Which procedures have you been using to obtain data from BIM for EPC generation?
- What are the benefits of using BIM to create the EPC?
- What was the impact on cost and reliability of the resulting EPC?
- What would be required to make the procedures effective in practice?

| | |
|---|---|
| 9:30 | **Setting the scene: EPC and BIM** – Álvaro Sicilia, ARC Engineering and Architecture La Salle, Ramon Llull University, Barcelona, Spain |
| 9:45 | **Integration of Open BIM and EPC: Lessons learned** – Benjamín González, CYPE Software, Alicante, Spain |
| 10:00 | **The open platform of the MODERATE project to enhance building processes** - Francesca Conselvan, e-think energy research, Vienna, Austria |
| 10:15 | **Panel discussion with presenters and audience: Which challenges remain? What is still needed to solve them?** - Moderator: Sabine Sint, SIMULTAN, TU Wien, Austria |

**Session 2: Integrating data sources in renovation roadmaps**

- Which benefits have you identified from establishing a linkage between, for example, Energy Performance Certificates (EPCs), energy audits, logbooks, and Building Renovation Passports (BRPs)?
- How have you addressed the establishment of such linkages in your activity?
- What is the impact on cost and reliability of information resulting from this interlinking of data/documents?
- What would be needed to make these procedures effective in practice?

| | |
|---|---|
| 11:15 | **Setting the scene: Making use of data repositories for generating renovation roadmaps** – Susanne Geissler, SERA global, Vienna, Austria |
| 11:30 | **The untapped potential of Austrian Energy Performance Certificates going public** – Armin Tahirovic, AH3 Architects, Horn, Austria |
| 11:45 | **Benefits and requirements of linking building data sources** - Nicole Hartl, Austrian Energy Agency, Vienna, Austria |
| 12:00 | **Integration of EPCs in the Administration databases** - Adrián Fernández, EREN - Ente Público Regional de la Energía de Castilla y León, Spain |
| 12:15 | **Panel discussion with presenters and audience: Which challenges remain? What is still needed to solve them?** - Moderator: Bettina Sticher, SERA global, Vienna, Austria |

## Session 3: Enhanced EPC - Integrating additional indicators, SRI, and BRP

- Which additional indicators have you identified in your project, and what are the advantages?
- How have you integrated them with the EPC?
- What is the impact on cost and reliability of information of the overall building performance?
- What would be needed to make these procedures effective in practice?

| | |
|---|---|
| 13:45 | **Setting the scene: Additional indicators, from design to implementation** - Boris Sučić, Jožef Stefan Institute – Energy Efficiency Centre, Ljubljana, Slovenia |
| 14:00 | **SmartLivingEPC: Advanced Energy Performance Assessment towards Smart Living in Building and District Level -** Stavros Koltsios, Centre for Research and Technology Hellas (CERTH),Thessaloniki, Greece |
| 14:15 | **Implementing the SRI** in **the national context – findings from research projects supporting the Austrian SRI testing phase -** Doris Österreicher, University of Natural Resources and Life Sciences, Vienna, Austria |
| 14:30 | **Integrating SRI in an EU project, Smart2B - Online Presentation** - Miguel Brito, Energias de Portugal (EDP), Sacavém, Portugal |
| 14:45 | **Panel discussion with presenters and audience: Which challenges remain? What is still needed to solve them?** - Moderator: Marcus Hummel, e-think energy research, Vienna, Austria |

## Session 4: Supporting the Renovation Wave

- What impact does the utilization of EPC databases have on the reliability and efficiency of renovation measures?
- How do you utilize EPC databases to develop building renovation plans?
- Which approaches have you identified to track the implementation of renovation measures, to ensure that decarbonisation of the building stock is actually achieved?
- What would be needed to make these procedures effective in practice?

| | |
|---|---|
| 14:45 | **Setting the scene: Building archetypes for developing municipal renovation plans -** Ilaria Ballarini, Politecnico di Torino, Italy |
| 16:00 | **URBAN Transformation COLLECTIVE for urbane conversion on different levels of action** - Jutta Wörtl-Gössler, Räume für Menschen Architektur, Vienna, Austria |
| 1615 | **Implementing Building Renovation Plans through a Holistic Data-Driven Platform -** Adirane Calvo, Álvaro Sicilia, Leandro Madrazo, La Salle-URL |
| 16:30 | **From one-time data collection to continuous monitoring** - Lukas Kranzl, TU Vienna Energy Economics Group, Vienna, Austria |
| 16:45 | **Panel discussion with presenters and audience: Which challenges remain? What is still needed to solve them?** - Moderator: Iná Maia, TU Wien Energy Economics Group, Austria |

# 4 Contributions

This chapter comprises summaries of accepted contributions edited by the TIMEPAC team, organized according to the programme schedule. Access to presentations is available through hyperlinks.

## Opening Session

### TIMEPAC vision of future energy performance certification

*Leandro Madrazo*
ARC Engineering and Architecture La Salle, Barcelona, Spain

TIMEPAC is an on-going EU-funded research project focused on implementing the next generation of energy performance certification, in line with the proposed changes in the recast of the Energy Performance of Buildings Directive (EPBD)[1] which is currently under negotiation by the European Parliament and the European Council as part of the "Renovation Wave" strategy[2] and the "Fit for 55" package[3]. The EPBD recast, together with the review of Energy Efficiency Directive (EED)[4], aims to equip Member States with more effective certification tools, facilitating their efforts to achieve a zero-emission building stock by 2050.

TIMEPAC's vision aligns with the objectives of the EPBD review, calling for a shift in how we approach the assessment of building performance. Rather than viewing them as isolated entities, TIMEPAC sees buildings as integral components of the built environment. They not only consume energy but also contribute to renewable energy sources and interact with the grid. Buildings are dynamic entities; their physical structure evolves over time through successive renovations, and their energy performance is influenced by changes in building equipment and occupant behaviours. In this context, energy performance certification cannot be confined to a single building or a specific moment in its lifetime. Rather, building performance needs to be considered holistically, encompassing the building and its environment, as well as its evolution over time.

In the transition from a static, one-off certification to a comprehensive, dynamic assessment, TIMEPAC the ability to collect building data from multiple sources, including energy consumption, indoor comfort, and renewable energy production, among others, is essential.

Moreover, ensuring the participation of multiple stakeholders involved in the certification process requires a continuous and seamless flow of energy certification data throughout the whole through the stages of generation, storage, analyses and exploitation.

TIMEPAC's primarily focus is on facilitating the flow of energy performance data thorough these four stages. Currently, challenges exist at each stage. Generating EPCs requires considering the actual building performance and utilizing other available data for making a more accurate assessment. Storing EPCs in databases necessitates systematic procedures to acquire and store data efficiently on a European scale. Analysing the stored data involves developing methods and tools to validate data quality and consistency in order to derive knowledge for informed decisions about building renovation. Lastly, we need to develop new business models that leverage these tools and transform EPC-enhanced data into valuable services, particularly for the multifamily residential sector.

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[1] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A52021PC0802

[2] https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficient-buildings/renovation-wave_en#:~:text=The%20Renovation%20Wave%20initiative%20builds,and%20climate%20plans%20(NECPs)

[3] https://www.consilium.europa.eu/en/policies/green-deal/fit-for-55-the-eu-plan-for-a-green-transition/

[4] https://www.euractiv.com/wp-content/uploads/sites/2/2022/07/EED_Final-Compromise-Amendment.pdf

# Session 1: Using BIM for the EPC generation process

## Setting the scene: Using BIM for the EPC generation process

*Álvaro Sicilia*
ARC Engineering and Architecture La Salle, Ramon Llull University, Barcelona, Spain

This presentation explores the possible improvement of Energy Performance Certificates (EPCs) through the use of Building Information Modelling (BIM). The European Commission's 2021 study identified problems with current EECs, citing their outdated, inaccurate and incomplete representation of building characteristics.

BIM can play a key role in two instruments proposed by the recast of the Energy Performance of Buildings Directive (EPBD): building renovation passports and the digital building log. Although the accuracy and reliability of BIM in data input is acknowledged, there is a hesitation to create BIM solely for the EPC due to time constraints. However, the integration of BIM in building renovation passports might justify the efforts invested.

The main challenge to integrate BIM with EPC generation lies in the interoperability between software applications. To overcome these pervading difficulties, the TIMEPAC project has elaborated a set of guidelines which were applied to the modelling of thirty buildings in six partner countries. The validation of existing BIMs took about eight hours and the creation of a BIM from scratch to generate an EPC took about twelve hours. The study underlines the importance of taking into account the competence of the technician and the complexity of the building when estimating the time required for the creation of a BIM.

A reliability assessment was carried out to show that deviations in the input data for generating energy certificates are significantly smaller when using BIM data, indicating heightened accuracy and reliability compared to traditional method involving floor plan drawings. Overall, the results highlight the potential of BIM to improve the reliability of input data for EPCs, contributing to a more accurate assessment of the energy performance of buildings.

While recognising the positive impact of BIM, addressing the ongoing challenge of interoperability between software tools requires collaboration among software developers, public bodies and academia.

## Integration of Open BIM and EPC: lessons learned

*Benjamín González*
CYPE Software, Alicante, Spain

Construction practices in today's world are undergoing changes, significantly influenced by the Building Information Modelling (BIM) methodology. Furthermore, the decarbonisation objectives established by the European Union are fostering an increased demand for environmentally-friendly buildings, enhancing our comprehension of sustainable practices. The Energy Performance Certificate (EPC) stands as a pivotal tool in attaining these sustainability goals. To optimise and improve EPCs, BIM methodology, and particularly Open BIM, plays a crucial role.

Within the BIM workflow, the 3D geometric model of a building is vital for simulations, covering areas such as energy, acoustics, lighting, fire protection, and accessibility. Open BIM stands out in this regard, simplifying the creation and validation of these models and ensuring they are perfectly tailored for multiple analyses.

One challenge associated with the geometric model for energy simulation is the analysis of thermal bridges, which are becoming increasingly crucial in evaluating building energy performance. Geometric BIM modellers, including Allplan, Revit, and Archicad, lack the capability to generate the required information for this simulation. Consequently, there is a need to develop an analytical model that incorporates the necessary information for the thorough examination of thermal bridges.

To ensure independence from specific BIM software vendors, the IFC standard holds significant importance in facilitating interoperability among diverse software platforms. Additionally, various file formats are available to meet specific needs within the BIM workflow, such as the GLTF format for viewing 3D models and the JSON format for facilitating communication between different software tools.

## The open platform of the MODERATE project to enhance building processes

*Francesca Conselvan*
e-think energy research, Vienna, Austria

Nowadays, the building sector can amass a substantial volume of data. However, owing to privacy concerns, companies face constraints in sharing customer meter data for inquiry and scrutiny. This limitation makes it difficult to elaborate a comprehensive and dynamic strategy for decarbonizing the building sector.

The European-funded project MODERATE seeks to address this challenge by establishing an open platform populated with synthetic datasets and data-driven services for analysing building performances. Synthetic data refers to artificially generated data that retains the statistical characteristics of real data without containing any identifiable information. This alternative approach broadens opportunities for collecting and sharing data, thereby facilitating knowledge transfer and collaboration. Advancements in machine learning technologies, particularly the use of Generative Adversarial Networks (GANs), enable the generation of synthetic data. In the MODERATE project, we use these techniques to generate electrical load profiles and Energy Performance Certificates (EPCs). Furthermore, the application of synthetic data extends to implementing technologies and methodologies for optimizing building energy efficiency. Presently, the MODERATE platform comprises a suite of ten tools, addressing analytics for system management, optimization, and decision-making aids

Among the tools in development is the Energy Performance Certificate Harmonization, aimed to standardize the development of these certificates across countries. This involves employing comparable parameters, clustering EPCs based on local, regional, and national criteria, and fine-tuning input parameters using real energy measurements.

# Session 2: Integrating data sources in renovation roadmaps

## Setting the scene: Making use of data repositories for generating renovation roadmaps

*Susanne Geissler*
SERA global, Vienna, Austria

The Energy Performance Certificate (EPC) contains recommendations for improving building energy efficiency. However, these suggestions often lack specificity, and their implementation remains unclear within the 10-year validity period of an EPC. In contrast, renovation roadmaps are tailored to individual buildings, detailing the necessary measures in the appropriate sequence to achieve the nearly zero energy building standard in the medium term and the zero-emission building standard in the long term.

The primary objective of formulating renovation roadmaps is to boost the renovation rate. To accomplish this, the preparation process should be streamlined for efficiency, focusing on saving both time and costs. Simultaneously, the roadmaps themselves must be effective, meaning that the proposed measures have to be properly implemented. Addressing the first concern involves leveraging existing building data to the maximum extent and employing workflows based on advanced software tools. Clarity regarding the intended recipient of the renovation plan is crucial for the second concern, as it directly shapes the prerequisites for the type and quality of data employed and influences the qualifications of the experts tasked with developing the roadmap. Lastly, it is crucial to track the implementation of measures to assess the improvement of the building stock and develop necessary policy instruments for adjustment if needed. In TIMEPAC, these aspects were investigated based on partner countries' situations, leading to recommendations for developing efficient and effective renovation roadmaps. This contribution offers an overview of the results and provides input for discussion and further work.

## The untapped potential of Austrian Energy Performance Certificates going public

*Armin Tahirovic*
AH3 Architects, Horn, Austria

What if we could use bulk energy certificate information for spatial energy planning, simulation, and modelling? We provide an overview of the applications and business cases of a public Energy Performance Certificate (EPC) database, demonstrating how the scarcity of publicly available energy and building data significantly hampers various stakeholders in their pursuits of climate neutrality and energy transition. We explore the accessibility of this high-quality resource, discussing both its technical and political feasibility.

We offer practical examples illustrating how EPCs could enhance future energy planning and analysis practices, providing estimates of potential co-benefits. Specifically, we draw a comparison between the handling of EPCs in Austria and Finland, showcasing the differences. Subsequently, we broaden our scope by comparing the availability of EPC data with other relevant sources for energy modelling, such as the HVAC registry, the digital cadastral map, and other pertinent databases. Additionally, we revisit the CityGML standard as an example of a data interface, comparing it to other ongoing developments.

## Benefits and requirements of linking building data sources

*Nicole Hartl*
Austrian Energy Agency, Vienna, Austria

The revised Energy Performance of Buildings Directive (EPBD) requires each Member State to set up a national database to collect information on the energy performance of buildings and facilitate data access for various stakeholders. The pertinent sources of information include Energy Performance Certificates (EPCs), inspections, energy advice records, funding databases, building renovation passports, and both calculated and metered energy consumptions.

Having digitally available data streamlines numerous processes and lessens the workload for various stakeholders engaged in building renovations:

- Using EPC data in energy advice
- Integrating energy advice recommendations into EPCs
- Ensuring access to:
  - Records of both implemented and funded measures
  - Reliable information for architects, master builders, or plumbers to propose customized renovation measures or recommend the appropriate use of renewable energies
  - Data for tendering processes
  - Demand and consumption profiles for proposing energy concepts

An analysis conducted as part of the crossCERT project reveals that, both in partner countries and Austria, digital tools in the building sector have not experienced widespread adoption. For instance, practices such as using printed EPCs for building permissions and printed report templates for energy advice are still prevalent.

However, in the federal state of Salzburg, there have been some advances in certain digital practices, such as entering data into a simplified version of the EPC software, uploading information to the designated EBS Manager, and establishing connections with available EPCs.

The requirements for making data digitally available and to utilizing them effectively entail several key elements that should be considered:

- Identification of sources of information
- Potential linkages among databases, data format and automation
- Data protection
- User interface
- Data quality
- Skills for data analysis
- Awareness raising

## Integration of EPCs in the Administration databases

*Adrián Fernández*
EREN - Ente Público Regional de la Energía de Castilla y León, Spain

Energy Performance Certificates (EPCs), Energy Audits, Building Logbooks, and Building Renovation Passports (BRPs) are tools recommended by the European Union to evaluate, diagnose, and document the condition buildings, with the goal of planning their renovation.

In the crossCERT project, we are evaluating the integration of EPCs into administration databases. Desk research is underway to assess the digitisation, interactivity and information availability levels within existing EPC databases across the crossCERT consortium. Additionally, the analysis aims to identify the barriers and challenges that hinder such integration and use. Moreover, various stakeholders, including public authorities, homeowners, ESCOs and researchers, have been

considered to better define the enhanced value of upgraded databases. The anticipated findings of the research will enable the proposal of technical guidelines to enhance the value of EPCs.

One of the proposals involves utilizing EPC databases to generate renovation roadmaps, facilitating a practical and efficient development of renovation and decarbonisation strategies aligned with EU objectives. In Spain, for example, there is currently no effective connection between the databases of EPCs, Energy Audits, Building Logbooks, or Building Renovation Passports. This lack of integration stems from the fragmented administrative management of each of these tools. However, linking the data provided by these various tools could have a significant impact on improving energy renovation policymaking. In the Spanish case, achieving such integration would require the administration to undertake a substantial cost for re-engineering the existing data management protocols.

In light of these challenges, the need for a paradigm shift in data management becomes apparent, calling for the establishment of one-stop-shops to document buildings. This would streamline the collection of construction and energy data, provide energy performance recommendations, and develop renovation action plans. An interactive database has the potential not only to strengthen renovation policies but also to improve the understanding of various stakeholders regarding the state of the building stock. Ultimately, it could encourage investments in building renovations.

# Session 3: Enhanced EPC - Integrating additional indicators, SRI, and BRP

## Setting the scene: Promotion of energy awareness in buildings – Additional indicators, from design to implementation

*Boris Sučić*
Jožef Stefan Institute – Energy Efficiency Centre, Ljubljana, Slovenia

This presentation provides an overview of the TIMEPAC Code of Conduct for Smart Readiness and Sustainability Rating, a voluntary initiative managed by the TIMEPAC consortium. This set of guidelines, values and principles is deemed essential for the successful, professional and transparent calculation of the Smart Readiness Indicator (SRI) and selected sustainability indicators in European countries.

The TIMEPAC Code of Conduct serves not only as benchmark for achieving expected benefits in the calculation of the SRI and sustainability indicators but also as a quality indicator for clients (building owner, facility managers, building users, etc.). It outlines what they should anticipate and demand from the SRI and sustainability auditors.

While energy consumption modelling is a vital initial step in enhancing a building's energy performance, it is only part of the process. Meaningful discussions about potential improvements can only begin once performance is quantified. Calculating relevant and case specific performance indicators is crucial for monitoring the operational performance of any building, whether residential or non-residential.

The presentation emphasized the inadequacy of current practices where building-related data are used only for single/dedicated purposes, making them unsustainable and unable to result in an enhanced Energy Performance Certificate (EPC). Enabling interoperability among existing databases, previously developed models (like BIM or BEM), and past energy audit reports is critical. This information should be accessible to building professionals (such as energy and facility managers, energy performance certifiers, designers, etc.) in a way that allows the new EPC to build upon previous data.

## smartLivingEPC: Advanced Energy Performance Assessment towards Smart Living in Building and District Level

*Stavros Koltsios*
Centre for Research and Technology Hellas (CERTH),Thessaloniki, Greece

In the contemporary era marked by energy and environmental crises, tackling the energy performance of buildings has become a critical challenge. Buildings significantly contribute to overall energy consumption (40% of final energy demand) and environmental impact (36% of $CO_2$ emissions). Energy Performance Certificates (EPCs) play a pivotal role in documenting and labelling the energy performance of buildings across the EU, making them a key tool in addressing this challenge. However, existing EPC schemes often fall short of delivering a comprehensive assessment, primarily focusing on validating building energy performance while neglecting broader environmental and human comfort aspects. Traditionally, assessments have been confined to either as-designed or as-operated evaluations or periodic energy audits.

Moreover, various EU research projects have explored innovative approaches to incorporating individual advanced technological solutions into the EPC domain framework. The current work presents a holistic software framework architecture that aims to integrate the set of introduced and established digital services (BIM, Digital Twins, Digital Building Logbooks, Building Renovation Passports, analytics based on Artificial Intelligence and Machine Learning) into a comprehensive EPC assessment scheme. The proposed solution expands its scope beyond the building level, introducing

the assessment of building complexes with the aim of energy certification at the neighbourhood scale.

The presented schema, comprising four distinct layers, establishes a streamlined procedure for data collection, management, processing, and presentation to end-users. Within this framework, nine core modules facilitate platform operation workflows and interdependencies. The presented approach, developed as part of the SmartLivingEPC H2020 project, aims to create an ecosystem designed not only to reduce energy consumption but also to enhance living conditions at both building and neighbourhood scales, ultimately fostering well-informed and engaged citizens.

## Implementing the SRI in the national context – findings from research projects supporting the Austrian SRI testing phase

*Doris Österreicher*
University of Natural Resources and Life Sciences, Vienna, Austria

The forthcoming recast of the Energy Performance of Buildings Directive (EPBD) envisions the incorporation of a Smart Readiness Indicator (SRI) specifically for non-residential buildings with an effective rated output for heating systems of over 290 kW. The SRI was initially introduced in the 2018 revision of the EPBD, and a methodology for its assessment has subsequently been proposed by a study conducted on behalf of the European Commission (EC). European Member States now have a five-year phase to test the implementation of the SRI, with Austria being among the first countries entering into this testing phase.

An Austrian consortium is aiding decision-makers by conducting a series of research projects to evaluate the feasibility of various SRI approaches. In an initial project, a "SRI Austria" was developed, building upon the original proposal by the EC. Subsequently, a study assessed different methodological approaches. While the EC methodology relies on a wholly qualitative assessment, the SRI Austria integrates both qualitative and quantitative aspects. A third methodology, developed by researchers from the BOKU, takes a quantitative path and assesses the overall load shifting potential of buildings or districts.

The goal of the study was to compare and assess these different approaches through a series of case studies, considering the validity of results, practicability for assessment, and flexibility in application for the definition of a Smart Readiness Indicator (SRI). The ongoing research project "SRI Demo", is centred on evaluating the proposed methodologies within the Austrian context and under the regulatory framework conditions of Austria. This project will implement measures to optimize the SRI in eight demonstration buildings and further develop a coherent SRI methodology, ultimately aiming to provide decision support for the SRI implementation in Austria.

## Integrating SRI in an EU project, Smart2B - The development of Smart Services to automatically assess SRI (Online Presentation)

*Miguel Brito*
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Smart2B is a project funded by the European Commission under Horizon Europe 2020. The aim of the project is to address the existing barriers of smartness upgrades for existing buildings by developing new software and hardware solutions to manage and control legacy equipment and smart appliances in an automated manner. The project's goal is to develop and demonstrate solutions that, irrespective of the building type, can provide Internet-of-Things (IoT) capabilities to legacy devices that can then be seamlessly integrated with existing smart building devices and energy management platforms.

To date, the main developments of the project include:

- Smart2B devices: Integration of various legacy type equipment, smart appliances and IoT sensors.

- Smart2B platform: A smart readiness platform designed for the seamless integration of devices and data. It is equipped with automated data analysis capabilities, encompassing statistical/machine learning, big data analytics, predictive analysis, and artificial intelligence.
- Smart2B services: User-centred services aimed at enhancing the smartness of existing buildings. These services cover aspects such as energy efficiency, indoor comfort, Smart Performance Assessment & Advisor, and energy flexibility services.

The Smart2B services and devices aim to provide additional information about the building, particularly through services focused on enhancing indoor air quality and energy efficiency. To establish a baseline for the dwellings, questionnaires regarding user thermal comfort and air quality were also developed.

Furthermore, a service named "Smart Performance Assessment & Advisor" will automatically calculate the SRI level of the building where it is deployed. It will also offer on potential improvements that can enhance the SRI. This service can be directly linked with EPCs to create a more holistic certificate.

# Session 4: Supporting the Renovation Wave

## Setting the scene: Building archetypes for developing municipal renovation plans

*Ilaria Ballarini*
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The European Green Deal, the Renovation Wave, and the proposed reform of the Energy Performance of Buildings Directive (EPBD) ) represent key policy initiatives by the European Union to assist Europe in achieving its climate goals. Within this framework, the Energy Performance Certificate (EPC) stands as a vital tool for identifying buildings in need of renovation, specifying the necessary interventions, and selecting the most efficient measures. The primary emphasis of this contribution is on the EPC's capabilities in conducting large-scale statistical analysis to develop renovation plans, inform policymaking decisions, and facilitate the evaluation of energy performance across the building stock.

The starting point of such analysis is data clustering and quality evaluation of an EPC database. This involves scoring the reliability of EPC data and implementing controls at various levels to eliminate inconsistent entries. Subsequent statistical analysis uncovers building archetypes that represent the typical technologies found in specific building stocks. Additionally, a simplified building stock energy modelling tool is developed to adapt datasets from representative buildings (using a bottom-up approach). This tool is designed to compute large-scale energy balances, enabling the assessment and monitoring of the effectiveness of renovation scenarios across the building stock.

Additionally, improving the precision of EPC data can be achieved by incorporating parameters like confidence intervals and distribution functions as rules in the control configuration. This data-driven approach substantially impacts the accuracy and effectiveness of renovation measures, leveraging inferential large-scale statistical analysis to derive findings and inferences about populations based on a sample of data. Nevertheless, practical effectiveness requires ongoing training activities, complemented by the availability of a sufficient and reliable database, along with the implementation of simplified yet accurate evaluation models.

## URBAN Transformation COLLECTIVE for urbane conversion on different levels of action

*Jutta Wörtl-Gössler*
Räume für Menschen Architektur, Vienna, Austria

Cities function as economic, cultural and social hubs, generating approximately three-quarters of global $CO_2$ emissions and consuming 78% of energy. Urban areas are inhabited by 75% of Europe's population a figure that continues to rise. Achieving climate goals necessitates a transformation of urban spaces, encompassing buildings, open spaces, infrastructure, and communities. Drawing insights from the study "Zukunftsquartiere," which focuses on the energy transformation of existing neighbourhoods, the Urban Transformation Collective strives for comprehensive planning to ensure holistic urban development.

The envisioned city of the future is characterized by its friendliness, greenery, coolness, and a traffic layout limited to main roads. Renovated living spaces prioritize energy efficiency, supplied sustainably by the community's own energy plant. In this urban landscape, children play safely in shared green courtyards or on car-free streets. Residents actively engage in community gardens, energy systems, and car-sharing initiatives, contributing to reduced fixed costs. The living environment is serene, tranquil, and health-oriented, featuring car-free zones on every second street. To bring this vision to life, the Urban Transformation COLLECTIV was established, combining expertise from seven diverse disciplines to drive transformative initiatives. The seven disciplines and some of the representing organisations are: ARCHITECTURE TOWN PLANNING (RfM Räume für Menschen Architecture); REFURBISHMENT (Arch.a J. Wörtl-Gössler, Arch.a U. Machold); SPACE LANDSCAPE PLANNING (Tilia Landscape Planning Office, DIin Dr.in Studer); ENERGY PLANNING (S.

Schneider, MSc energy planner); TRAFFIC PLANNING (Trafility GmbH, traffic planning DIin Dr.in C. Presinger); SOCIOLOGICAL SUPPORT (wohnbund:consult eG); HEALTH. Climate-neutral transformation of our cities and settlement areas involves developing interdisciplinary approaches that prioritize climate readiness, resilience, and healthy development. These concepts are built upon technical frameworks integrating various disciplines, leading to the derivation of comprehensive packages of measures.

The final step involves formulating concrete and integrated implementation plans designed to achieve the following targets by 2040:

- Achieve $CO_2$-neutral energy supply with zero emissions. Develop renovation concepts that incorporate new energy supply applications and utilize sustainable materials, re-use, and green practices.
- Attain $CO_2$-neutral properties with zero emissions. Enhance the quality of open spaces, contribute to cooling through shading potential, unsealing, and traffic calming.
- Establish $CO_2$-neutral neighbourhoods with zero emissions. Reduce motorized individual traffic by focusing on active, health-promoting, and inclusive mobility.
- Realize $CO_2$-neutral traffic with zero emissions. Develop social activation programs, encourage citizen participation, and monitor and evaluate measures for their impact on health promotion.
- Create a healthy living environment for all. Digitally develop a common language as a backbone for data exchange among participants, establish communication structures for inhabitants, and ensure a cohesive digital framework.

A collaborative effort among these stakeholders is essential for the successful implementation of the outlined objectives:

- Administration: City councils, municipalities, and active involvement of residents.
- Building sector: Property management, property owners, developers, and related entities.
- Service providers: Energy suppliers, mobility providers, and other relevant service providers.

## Implementing Building Renovation Plans through a Holistic Data-Driven Platform

*Adirane Calvo, Álvaro Sicilia, Leandro Madrazo*
ARC Engineering and Architecture La Salle, Ramon Llull University, Barcelona, Spain

Building renovation plays a central role in accomplishing the objectives set out in the European Green Deal and in the Renovation Wave initiative. The RETABIT project, co-funded by the Spanish Ministry of Science and Innovation, aims to create a data-driven platform dedicated to streamlining the design, execution, and monitoring of renovation plans for the existing building stock. Aligned with the goals of Sustainable Energy and Climate Action Plans, the RETABIT platform adopts a multifaceted approach to renovation, considering crucial elements such as energy efficiency, socioeconomic conditions, and environmental impact:

- Energy efficiency: Utilizing building archetypes characterized with EPC data, the platform calculates indicators such as final energy consumption, heating energy consumption, and greenhouse gas emissions.
- Socioeconomic conditions: These are characterized with indicators of housing prices and median household income. By considering these factors, the platform provides valuable insights into the implications of renovation plans for both individual households and the broader community.
- Environmental impact: The platform evaluates factors like the accessibility of urban amenities within a 15-minute walk, the extent of green area coverage, and the vulnerability of buildings to heatwaves and temperature rise.

The comprehensive consideration of energy efficiency, socioeconomic conditions, and environmental impact, as provided by RETABIT, can lead to well-informed and integrated renovation strategies for urban environments. This holistic approach ensures that renovation plans are not only environmentally sustainable but also socially and economically beneficial, contributing to the overall well-being and resilience of urban communities.

## From one-time data collection to continuous monitoring

*Lukas Kranzl*
TU Vienna Energy Economics Group, Vienna, Austria

The effective design of policy instruments requires data, specifically in the context of the energy transition within the building stock, ranging from municipal to regional, national, and EU levels. The Energy Efficiency Directive (EED) 2023 mandates Member States to enforce heat planning. However, often data related to buildings' energy performance and about installed heating and cooling systems, lacks the necessary level of detail. Historically, data collection has often been a one-time occurrence. Presently, various initiatives are tacking this challenge through concepts that facilitate the creation of a continuously updated database. This ongoing process supports the guidance, implementing measures, and operation of buildings.

This presentation will showcase examples from the following projects, drawing conclusions regarding a shared foundation and pathways for advancement:

- RenovEU: Developed a tool for the automated creation of renovation scenarios to improve the estimated energy performance of residential buildings. This tool assigns a modelled building typology to each residential building through a connection with the National Cadastre. During more in-depth consultations, advisors can update certain data and input it back into the system, facilitating continuous database improvement. OneClickReno (starting 11/2023) will replicate and expand upon this tool, enhancing the accuracy of estimated building typology performance and providing automatic staged Building Renovation Passports (BRPs) combining different renovation scenarios.
- Austrian Spatial Energy Planning: Implementing a concept for a continuously updating database to support spatial energy planning by integrating various data sources such as EPC databases and building registry data.
- MODERATE: Developing a platform that allows data holders to share and analyse measured energy consumption data while adhering to GDPR regulations.
- EPBD.wise (starting 10/2023): Supporting Member States in implementing the forthcoming revised EPBD. In this context, the establishment of effective monitoring systems will be crucial.

In conclusion, allocating effort to one-time data collection, which quickly becomes outdated, would be more effective if directed towards establishing intelligent and continuously updating dynamic data concepts. Various methods are already available or in the process of being prepared to facilitate this transition.

# 5  Panel discussions

## 5.1  Session 1 - Using BIM for the EPC generation process

Participants in this session emphasised that there is still a lack of interoperability between the various stages of the certification process. Although the IFC exchange format exists, a lot of work is still needed to connect a BIM model with an EPC.

TIMEPAC partner CYPE Software addressed interoperability inconsistencies by utilizing two distinct and independent models—an architectural model and an analytical model, both containing only essential information. Responding to a practitioner's concern about the need for well-equipped hardware to generate and manage these 3D models, Benjamín González of CYPE Software offered an analogy: comparing creating a BIM model to packing for a hike on "El Camino de Santiago": you only carry bare essentials on a journey. The same applies to the information stored in a BIM model. His advice is straightforward: when considering adding information to a model "just in case", forget it! Additional data in a BIM model will be as hard to carry on as each gram in your backpack.

The panellists also shed light on different perspectives on how individual models can be viewed. The aim is to fulfil the requirements of both planners or architects and the IT experts. Sabine Sint, TU Vienna SIMULTAN, mentioned SysML (System Modelling Language), which allows the observation of nine different types of perspectives on the same topic. Francesca Conselvan, e-think energy research, described a somewhat artistic approach to data preparation. They perform a pre-selection upon receiving data, cluster it based on similarities, and generate synthetic data for increased accuracy. Using the MODERATE project as an example, she introduced the use of neural networks. While EN and ISO standards are mentioned concerning common parameters, they may not be entirely helpful for achieving a standardised approach across European countries.

**Table 1.** Challenges and solutions as discussed in Session 1

| Challenge | Solution |
|---|---|
| Where is existing data stored and who has access to it? | Collaboration |
| | Communication |
| | A joint solution |
| | Data management lies with the authority, appears more secure and is to be presented to the homeowners |
| Costs | Provision of subsidies |
| Data security issue | Training |
| Data sharing | Communication |
| BIM to EPC - IFC: difficulties to exchange | Requires more collaboration between the stakeholders because BIM can help fostering the renovation |
| | Training and communication are needed |
| | Think before creating: what is the purpose? |
| | The imported data is decisive |

| Challenge | Solution |
|---|---|
|  | To have one method for all countries |
| Interoperability | The applications of TIMEPAC partner CYPE Software with over 170 applications (12MB) and a sort of (or even more as) CDE (Common Data Environment) called BIMServerCenter |
|  | The information does not have to be carried all the way when creating a model |
|  | Pre-selection of data |
|  | Harmonise the EPC in all European countries |
|  | Interaction between different practitioners |
| BIM data | Do not take all data with you, not even just-in-case data |
| BIM practise | Think different - away from the planning, detached from the construction, the edges in the foreground |
| Data sharing | Having a platform is a cornerstone |
|  | Making the providers understand that giving data is enlarging the wisdom |

## 5.2 Session 2 - Integrating data sources in renovation roadmaps

This panel discussion was marked by numerous questions from the audience, bringing to light various aspects. Some participant observed that the EPC might not be as detailed as expected, while the panellists, echoing the previous discussion in Session 1, reiterated the differences among the European countries.

The EPC is demand-oriented, and can be complemented by the Renovation Roadmap and the BRP (the BRP-Building Renovation Passport, distinct from renovation planning). An on-site visit to collect consumption data is essential. Armin Tahirovic, AH3 Architects, mentioned that while his office provides the energy certificate, it essentially "runs alongside" planning and construction activities. An architect in the audience mentioned that that it is very difficult to obtain data from owners, due to data protection reasons. Susanne Geissler, SERA global, suggested that data protection might be used as an excuse or that extensive Austrian data protection laws might cause hesitation due to fear of making mistakes. The province of Salzburg, Austria, manages a database called ZEUS in which EPCs are uploaded and can be complemented with additional building information (unique building account). This database, present in six federal states, allows building owners to upload and complement EPCs with additional information which can be accessed by third parties, for example architects. Despite this, it is underutilized, as data is not published by the authority but is available for research purposes upon request.

While renovation roadmaps ideally should be based on energy audits, there is currently no connection between EPC and energy audit in Austria, and the same holds true for Spain. Armin Tahirovic emphasised the importance of defining relevant building data and establishing boundaries in the context of renovations. Using the example of window values, he questioned whether homeowners

could afford triple-glazed windows with a value of 0.8 to 0.9 W/(m²K) or if 1.1 W/(m²K) is sufficient. Who draws the line, for buildings and for subsidies? Nicole Hartl from the Austrian Energy Agency advocated for considering the comfort of residents as a key value in renovations, suggesting a step-by-step approach or the possibility of complete building renovation. She highlighted crucial questions in developing a renovation roadmap: What is the cost, what is the purpose, and who is the target group?

**Table 2.** Challenges and solutions as discussed in Session 2

| Challenge | Solution |
|---|---|
| Where is existing data stored and who has access to it? | Collaboration |
| | Communication |
| | A joint solution |
| | Data management lies with the authority, appears more secure and is to be presented to the homeowners |
| Costs | Provision of subsidies |
| Data security issue | Training |
| Data sharing | Communication |

## 5.3 Session 3 - Enhanced EPC - Integrating additional indicators, SRI, and BRP

The discussion started by touching upon some issues previously explored in Session 1. BIM has the capability to document the correlations between energy consumption and comfort. If AI is incorporated to provide targeted recommendations for enhancements, it might result in a sophisticated Energy Performance Certificate (EPC).

Stavros Koltsios, CERTH, is part of an operational working group that is actively working on implementing a roadmap for countries, aiming for a practical guide on enhancing the EPC scheme applicable across many sectors. A preliminary draft is has already been developed. In response to a question about whether the SRI assessment pertains to a district or a building, Doris Österreicher, University of Natural Resources and Life Sciences Vienna, noted that the district approach is particularly interesting for energy providers. Sylvain Robert, CINEA, European Commission, emphasized the importance of distinguishing between EPC, focusing on building energy performance, and SRI, centred around smart technologies and other indicators, before considering potential combinations.

Boris Sučić from the Jožef Stefan Institute highlighted the challenge of interpreting the percentage score of SRI. A value of 25% might give the impression of being low, prompting the question: "Why do I have so little? He likened this perception to school experiences. The moderator reminded that the SRI is implemented in the Austrian federal system. Doris Österreicher elaborated, stating that the Austrian Institute of Construction Engineering (OIB) is the national institution responsible for overseeing SRI, and currently, there is an ongoing national test phase. Boris Sučić shared positive developments in in Slovenia, where different electricity tariffs, driven by smart devices managing heat pumps, electric charging, and solar power plants are being explored. These advancements will be presented in a separate document linked to the EPC and the energy audit. Stavros Koltsios

mentioned successful outcomes from living labs in Estonia and Cyprus, showcasing effective collaboration with stakeholders in demonstrating a service platform.

**Table 3.** Challenges and solutions as discussed in Session 3

| Challenge | Solution |
|---|---|
| How to push the SRI forward? | Service platform |
| | Communication |
| | Offering a logbook |
| | Living Lab |
| Data access | Communication, energy audit, architect´s on-site visit |
| | Preparing data, data availability |
| | New platform with AI services |
| Discrepancies between the researchers and the end users | Living labs |

## 5.4 Session 4 - Supporting the Renovation Wave

The panel discussion began with an audience question centred around the energy expended in collecting data on energy consumption: are we using more energy in the data collection process than we are saving overall. One response suggested that the current data quantities remain negligible, and the demand can be met through the utilization of renewable energies with global coverage.

Lukas Kranzl from TU Vienna further inquired about the calibration of data clustering for building archetypes and achieving the next level, particularly at the city level. Ilaria Ballarini from Politecnico di Torino clarified that there is currently no actual energy consumption data available for calibrating the archetypes. She highlighted the absence of comparisons between the standard consumer and the real consumer in relation to these archetypes.

Jutta Wörtl-Gössler, architect, raised the question of where data intersects with architects in the planning and renovation process. She emphasized that while data is crucial, it alone is insufficient; there is a need for a comprehensive map enriched with information about energy poverty and social aspects. Adirane Calvo, La Salle-URL (FUNITEC), replied referring to the platform RETABIT, designed to integrate economic and social information with energy data with the aim to facilitate large scale building renovation programmes. The information provided by the platform will be useful for the public, for municipalities and architects and planners involved in renovation projects.

Leandro Madrazo, La Salle-URL (FUNITEC) underscored the significance of the expression "Data meets architecture". Within the RETABIT project, the seamless integration of information and knowledge aims to support architects and planners. The aim of the project goes beyond merely providing information; it focuses on empowering users of the platform to extract knowledge from the information available. RETABIT is envisioned as a space where the realms of data and architecture converge, delivering information in a manner that assists that assists users in comprehending the intricacies involved in taking a holistic approach to building renovation.

In response to an audience inquiry about how architects persuade homeowners to undertake building renovations, Jutta Wörtl-Gössler acknowledged the difficulties. However, she highlighted a positive

development with the Renovation Wave, noting that it has significantly propelled renovation efforts forward, leading to noticeable changes. The surge in energy prices might have also contributed to this impulse.

**Table 4.** Challenges and solutions as discussed in Session 4

| Challenge | Solution |
|---|---|
| Lack of real energy data | Correlate the indicators |
| Data reliability | Adjust quality requirements with the specific use |
| Data gaps | Multidimensional archetypes as explored by RETABIT |
| Energy information platforms | Information becomes knowledge |
| | Data meets architecture |
| Boosting building renovation | Machine learning algorithm in project MODERATE |
| Owners versus tenants | Calculate savings |

# 6  Conclusion and future outlook

Seamlessly transitioning from a BIM model to an EPC remains a challenge. Interoperability is still in search of its definitive solution. One prospective avenue for future development involves the emergence of a new professional field of expertise specialized in creating BIM models specifically tailored for EPC generation and stepwise renovation.

The provision of relevant data for the renovation roadmap faces challenges that may seem easy to solve at first glance. In reality, the primary focus should be on improving communication  in order to empower authorities and, concurrently, to inform homeowners that sharing their data will yield tangible benefits. It is crucial to convey to all parties involved that building renovation will positively impact both public and private interests, in the short and long term. Nevertheless, a more effective communication strategy is needed to underscore these benefits.

Integrating additional indicators should not lead to confusion about the specific goals of the instruments that make use of them (EPC, SRI, BRP). Indicators should be assessed independently before being correlated or documented within the realm of a particular instrument. The expanded utilization of living labs and service platforms facilitates the connection of research with real-life conditions, ensuring that standards are grounded in practical references. Improved communication stands out as a primary requirement, and the support from all participants is essential to ensure the availability of data required by the various indicators

To support the Renovation Wave, it is crucial to align knowledge with data. This implies creating models from available data that proper reflect the complexity of assessing the building energy performance in a comprehensive manner, and to understand the impact of the renovation measures beyond the building's immediate confines. Simply providing platforms that facilitate data might not suffice. Moreover, these platforms should empower users to convert data into valuable insights.