TIMEPAC

Towards Innovative Methods
for Energy Performance Assessment and Certification of Buildings

Deliverable 3.2

Report on EPC exploitation through advanced analysis

Lead Beneficiary: Edilclima srl (EDIC)

Date: 30.04.2024

Version: 1.0

Dissemination level: Public

www.timepac.eu

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grand agreement N° 101033819.

Document description

Deliverable No.	3.2
Dissemination level	Public
Authors	Alice Gorrino (EDIC)
Contributors	All consortium members have provided content for this document
Due date of deliverable	30.04.2024
Actual submission date	30.04.2024

Version	Date	Beneficiary	Author
V0.1	15.02.2024	EDIC	Alice Gorrino
V0.2	13.03.2024	GOLEA	Matej Pahor
V0.3	14.03.2024	RP	Silvio De Nigris
V0.4	15.03.2024	SERA	Bettina Sticher
V0.5	18.03.2024	IEHP	Ilja Drmač
V0.6	18.03.2024	EDIC	Alice Gorrino
V0.7	19.03.2024	ICAEN	Marta Chàfer
V0.8	19.03.2024	SERA	Bettina Sticher
V0.9	21.03.2024	EDIC	Alice Gorrino
V0.10	26.03.2024	RP	Silvio De Nigris
V0.11	09.04.2024	EDIC	Alice Gorrino
V0.12	15.04.2024	ICAEN	Marta Chàfer, Ainhoa Mata (internal review)
V0.13	18.04.2024	RP	Silvio De Nigris
V0.14	19.04.2024	EDIC	Alice Gorrino
V1.0	29.04.2024	FUNITEC	Leandro Madrazo, Lisa Kinnear (proof-reading)

Table of contents

List of tables

List of figures

Executive Summary

This document provides a summary of the activities undertaken in Task 3.2 "EPC exploitation through advanced analysis " of Work Package 3 (WP3) “Verification Scenarios”. The main goal of this work package is to validate the results of the Transversal Deployment Scenarios (TDSs) developed in Work Package 2 (WP2), through the involvement of local stakeholders engaged in building certification procedures. With this purpose, a total of nine workshops were organized in six partner countries from October 2023 to January 2024.

Guest speakers and audiences participated in the in-person workshops which were organised in the same format across the six countries, with TIMEPAC partners presenting the project framework within the context of the EPBD. The topics addressed varied depending on the audience.

In Austria, the focus was on the Renovation Passport, renovation roadmap, challenges in practical implementation, and the enhanced Energy Performance Certificate (EPC) with connections to data repositories and BIM tools.

In Croatia, the workshop was combined with Task 3.1 “Improving certification with enhanced EPCs”, leading to discussions on generating EPCs using the BIM approach, EPCs and operational data, EPCs and Renovation Passports, and Smart Readiness Indicator (SRI) and sustainability indicators.

In Cyprus, the workshop focused on building renovation scenarios, the enhanced EPC concept, and the Smart Readiness Indicator.

In Italy, professional firms utilizing BIM were engaged, leading to discussions primarily focused on using BIM tools in building renovation projects within the new concept of a renovation roadmap.

In Slovenia, where the workshop covered combined Tasks 3.1 and 3.2, discussions focused on the Smart Readiness Indicator, energy audit processes, and Renovation Passport development.

In Spain, the workshop was divided into two parts, the first about integrating energy certificates with BIM methodologies (Task 3.1), and the second part on integrating SRIs and Level(s), along with building Renovation Passports and certificates (Task 3.2).

Throughout the workshops, stakeholders from diverse backgrounds took part, totalling 136 individuals, primarily falling into the "professionals" category, excluding our project partners. The valuable feedback provided by participants contributed to the preparation of the TIMEPAC Academy activities.

1 Introduction

The purpose of WP3 "Verification Scenarios" was to share the visions of enhanced building performance developed in WP2 "Transversal Deployment Scenarios" (TDS) with local actors involved in building performance certification and to provide insights into the knowledge gaps to be fulfilled by the training scenarios to be conducted within WP4 "EPC Standardisation, Training and Capacity Building" (Figure 1).

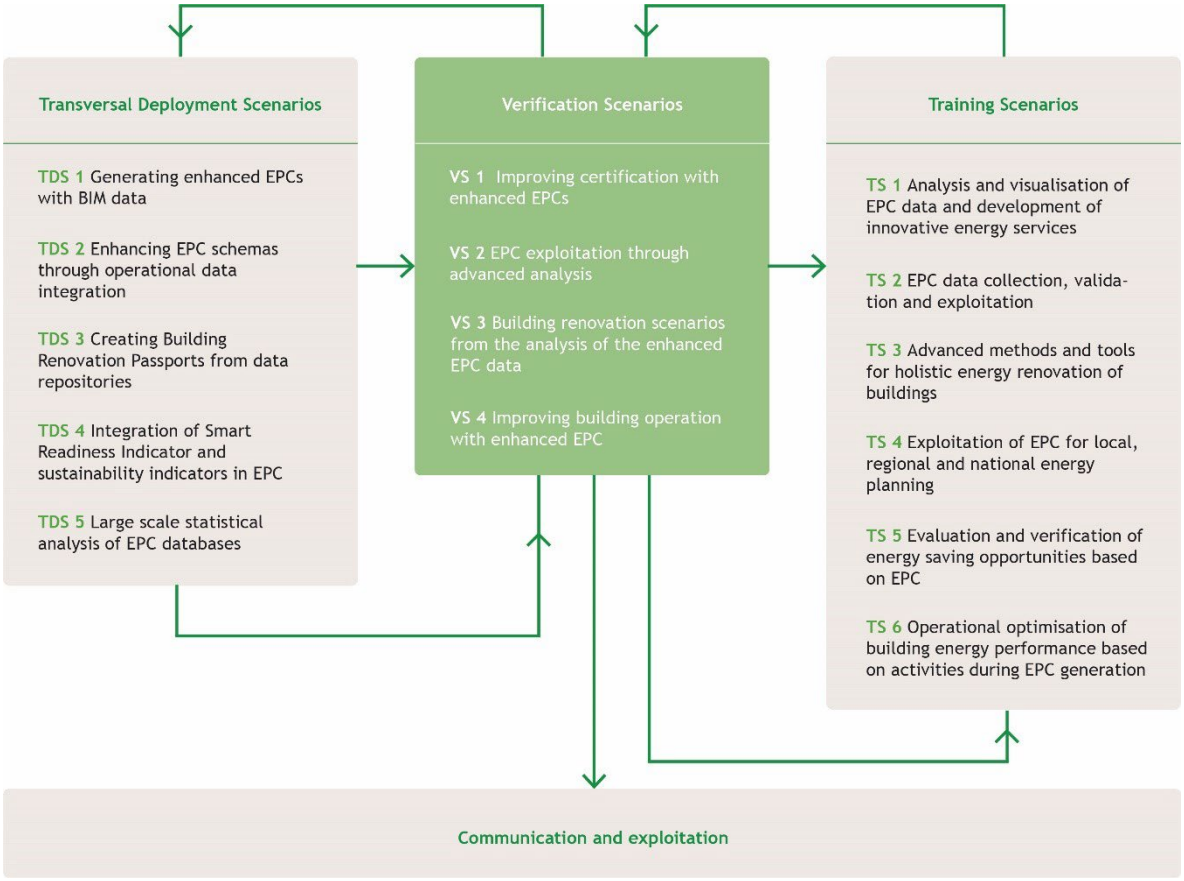

Figure 1. Interconnections between Transversal Deployment Scenarios, Verification Scenarios and Training Scenarios

The work of WP3 was organised into four tasks, each one targeting specific audience groups:

- Task 3.1 "Improving certification with enhanced EPCs" – tailored for professional certifiers, energy agencies, and municipalities.
- Task 3. 2 "EPC exploitation through advanced analysis" - for professional Certifiers and energy agencies.
- Task 3.3 "Building Renovation Passports from the analysis of enhanced EPC data" - aimed at energy agencies and municipalities.
- Task 3.4 "Improving building operation with enhanced EPC" – intended for building managers and end-users.

As part of each task, partner organizations arranged a series of Verification Scenarios with local stakeholders in Austria, Croatia, Cyprus, Italy, Slovenia, and Spain. The purpose of these workshops was to present and discuss the enhanced building performance scenarios, gather feedback from

participants, and identify areas requiring further skill development to be provided through the activities conducted within the TIMEPAC Academy.

This document serves as a report on the implementation of Task 3.2, "EPC exploitation through advanced analysis," which focuses on demonstrating the procedures for implementing the Renovation Passport through data repositories, considering the use of BIM methodology to track refurbishment scenarios over different timeframes. The workshops for this task were conducted in partner countries from October 4th, 2023 to January 11th, 2024.

1.1 Purpose and target groups

The aim of Task 3.2 was to verify the procedures envisioned in TDS 3 "Creating Building Renovation Passports from data repositories" and in TDS 1 "Generating enhanced EPCs with BIM data". The objective of TDS 3 was to create procedures for tracing the evolution of building renovation using various data sources such as BIM, EPCs, energy audit reports, and operational data, among others. The aim of TDS 1 was to develop comprehensive guidelines to evaluate the feasibility of generating EPCs from BIM models.

Participants in the Task 3.2 workshops, carried out by partners at their respective locations, were selected based on their level of influence on the addressed topic and their specific skills. This document includes a summary of the collective findings. The summary assists in identifying both the differences among countries regarding their current certification procedures and the common barriers and obstacles they face in aligning with the TIMEPAC vision to improve them.

1.2 Deliverable structure

The report is structured in the following sections:

- Section 2 "Verification Scenario" contains a detailed description of the scenario highlighting its components and illustrating its interconnection with WP2 and WP4.
- Section 3 "Workshops" is divided into six sub-sections, each containing descriptions of workshops conducted in the respective participating countries.
- Section 4 "Participants" includes participant numbers, organizational distribution based on target groups, and the extent of involvement with other concurrent national or European initiatives.
- Section 5 "Findings and conclusions" offers insights drawn from the experiences in the workshops in the various countries.

1.3 Contribution of partners

Project partners in Austria, Croatia, Cyprus, Italy, Slovenia and Spain organized the workshops in their respective regions and countries. Regione Piemonte, as WP3 leader, was in charge of coordinating the Work Package, providing guidelines and monitoring the implementation of the tasks.

1.4 Relations to other project activities

The work carried out in Task 3.2 serves to interlink the Transversal Deployment Scenarios fulfilled in WP2 with the training programme to be performed in WP4. The workshops were carried out in parallel with a survey organised as part of the exploitation plan conducted in WP5 "Communication, Dissemination and Exploitation". The activities conducted within the workshops have been disseminated through the project website and social media channels.

2 Verification scenario

The aim of the Verification Scenario implemented as part of Task 3.2 “EPC exploitation through advanced analysis”, was to verify the procedures developed within Transversal Deployment Scenarios TDS 3 “Creating Building Renovation Passports from data repositories” and TDS 1 “Generating enhanced EPCs with BIM data”.

The TDS 3 “Creating Building Renovation Passports from Data Repositories” objectives were to analyse the possibilities of using data repositories for creating a Renovation Roadmap which is defined by a sequence of renovation measures to be implemented in steps and to achieve nZEB (nearly zero-energy building) and ZEB (zero-emission building) targets. This involved defining distinct renovation measures that can be tracked through implementation and identifying potential mechanisms, such as enhancing the EPC database or utilizing a BIM database, to trace the implementation of these measures. The analysis of several example buildings in partner countries formed the basis to produce the guidelines to generate Renovation Passports from data repositories.

The TDS 1 “Generating enhanced EPCs with BIM data” objectives were to develop comprehensive guidelines to evaluate the feasibility of generating EPCs from BIM models, promoting the adoption of BIM for EPC generation. The guidelines outline the steps involved in extracting relevant data from BIM models and converting it into the required inputs for EPC calculation using specific tools. This encompasses details regarding the building's geometry, materials, systems, and performance characteristics. By leveraging BIM as a reliable source of consistent data, the guidelines aim at tackling the issues of outdated, inaccurate, or incomplete information that impedes the accurate generation of EPCs. Additionally, the guidelines promote open interoperability procedures, facilitating smooth data exchange between BIM models and EPC software to ensure a seamless flow of information.

In the version of the EPBD (recast)[1] approved by the European Council, the Renovation Passport is mentioned as a voluntary tool comprising a “clear roadmap for staged deep renovations” with the objective of a zero-emission building stock by 2050 at the latest. From the EPBD, it is evident that the Renovation Passport will be one of the main instruments for decarbonising buildings, therefore the main actors involved in the building renovation field should be informed and kept up to date with its development. The Renovation Passport should be connected to different data sources, to facilitate the relationship among data as well as the tracking of the building renovation steps. Therefore, integrating BIM with building assessment and certification will be very important since it will help in following the renovation steps, speeding up the modelling procedure and allowing to better link the building retrofit with the generation of the building EPC. With this purpose, the outcomes of TDS 1 “Generating enhanced EPCs with BIM data” and TDS 3 “Creating Building Renovation Passports from data repositories” have been combined to show an overall procedure.

The findings derived from the meetings with local stakeholders in these countries has provided some valuable insights about the training activities to be carried WP4 “EPC Standardisation, Training and Capacity Building”. In particular, the collected input is relevant for the following Training Scenarios (TS):

- TS1 “Analysis and visualisation of EPC data and development of innovative energy services”, since it focuses on the innovative energy services that can derive from the enhanced EPC, envisioned as a central document accessible to various stakeholders containing multiple data. In this context, Renovation Passport plays a key role, together with the use of BIM approach for analysing and visualising EPC data.

[1] DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on the energy performance of buildings (recast). Document date: 2024-04-03.

- TS2 “EPC data collection, validation and exploitation”, since it focuses on the data collection process and data extraction from various sources, including the generation of EPC from BIM model.
- TS3 “Advanced methods and tools for holistic energy renovation of buildings”, which focuses on integrating BIM models with simulation tools for improving the assessment of building performance. In this context, Renovation Passport is also described with a focus on data and tools.
- TS4 “Exploitation of EPC for local, regional and national energy planning”, since it includes the renovation roadmap, as a result of the Renovation Passport, as a tool for supporting the decarbonisation of the building stock.

Methodology of the workshops

The workshops organized in each country lasted four hours on average and were conducted in person. To ensure maximum efficiency and interactivity, a limited number of participants were invited. The objective was to facilitate robust interaction among participants. Specifically, the aim was to include a balanced representation of different stakeholders to collect different perspectives and points of view.

Each workshop's programme was tailored to the specific context in each country. Topics were selected from the Transversal Deployment Scenarios and customized to suit each context. The workshops were conducted in local languages to make them more accessible to target groups, broadening the audience and increasing their overall impact and reach.

To evaluate the workshops' effectiveness, ICAEN conducted post-event surveys among the participants, aiming to gather valuable feedback for the organizers. Furthermore, the insights collected from all participating countries were utilized to enhance the training materials of WP4.

The key issues driving the discussion with stakeholders generally belonged to the following main topics:

- Integration of the Renovation Passport with the EPC
- Using BIM in the certification process and in the building renovation process

The following section provides information about the workshop implementation in the six participating countries.

3 Workshops

The goal of the workshops was to explain the outcomes of WP2 “Transversal Deployment Scenarios” to interested stakeholders, inviting them to engage in active discussion and debate. The participants were asked to identify potential barriers to the implementation of new procedures and to provide insights for overcoming these obstacles.

The format and content of the workshops was structured in a highly flexible manner, allowing for the adaptation of contents to the local context and the invited stakeholders. This flexibility allowed for the combination of various topics into a single workshop or to divide the content into multiple workshops.

In the following table, the workshops carried in each country are listed.

Table 1. Timeline for the implementation of the workshops of the Task 3.2

Country	Dates
Austria (Salzburg)	04.10.2023
Austria (Vienna)	10.10.2023
Austria (Graz)	13.10.2023
Austria (Klagenfurt)	22.01.2024
Croatia	15.11.2023
Cyprus	29.11.2023
Italy	1.12.2023
Slovenia	14.11.2023
Spain	20.10.2023

3.1 Austria

Dates and locations

Because of Austria's federal system, the SERA Institute, as the host, chose to conduct the workshops in specific federal states, with each being held in its respective capital city, in order to gather a diverse range of feedback on TIMEPAC results in the most effective manner possible.

SERA organized four workshops to examine the challenges for the practical implementation of a Renovation Passport, including the renovation roadmap and the enhanced EPC with links to data repositories and BIM. All topics included in the Verification Scenarios were addressed in these workshops, albeit with varying depth, depending on the professional background and interests of the audience. At the conclusion of the workshop series, a joint report was produced and made available to all participants.

The workshops were as follows:

- October 4th 2023, Department of Energy Management and Consultancy of the administration of the Province of Salzburg, Günter-Bauer-Straße 1, 5071 Wals-Siezenheim.
- October 10th 2023, at the IG Architektur (architecture collective), Gumpendorferstraße 63B, 1060 Vienna.
- October 13th 2023, Cowork zu Geidorf, Villefortgasse 11, 8010 Graz (Styria).
- January 22nd 2024, Kärntner Landesfeuerwehrverband Rosenegger Straße 20, 9020 Klagenfurt (Carinthia), organized with the collaboration of klimaaktiv, the Austrian climate protection initiative, and DI Gerhard Kopeinig (ARCH+MORE ZT GmbH) (Figure 2).

In Graz and Salzburg, participant pictures are unavailable due to privacy policies.

Figure 2. Snapshot of the workshop in Klagenfurt/Carinthia

Topics addressed

The main topics covered in the workshops related to this Verification Scenario included the Renovation Passport and renovation roadmap, focusing on the challenges associated with their practical implementation based on EPC data. Another significant topic was the enhanced EPC, emphasizing its connections to data repositories and BIM tools.

Some of key questions addressed included: What will the next generation of EPC look like? What is the purpose of the Renovation Passport and what functionalities should it entail? Who is responsible for its creation? Additionally, discussions centred on the utilization of data from the ZEUS Energy Performance Certificate database, which serves as a central repository used in the Province of Salzburg and other Austrian provinces.

Stakeholders

The stakeholders participating in the Austrian workshops and their profiles are shown in Table 2.

Table 2. Stakeholders attending the workshops in Austria

Stakeholder	Category
Manager of the Independent Control System of EPC of the Province of Salzburg	Public authority
Managing director of the Energy Advice Centre of the Province of Salzburg	Energy agency
Energy consultant of the Energy Advice Centre of the Province of Salzburg	Energy agency
Architektur Wildner	Architect
Institute for Sustainable Technologies (AEE - Institut für Nachhaltige Technologien)	Designer, consultant, researcher (company)
Kommunalkredit Public Consulting (KPC)	Financing, public authority
University for Continuing Education (Universität für Weiterbildung Krems)	Property manager, researcher
University for Continuing Education (Universität für Weiterbildung Krems)	Designer, researcher
Real estate management / University of Applied Sciences FH Wien der WKO	Real estate, researcher
AH3 Architekten ZT GmbH	Designer and professional certifier
Austrian federal climate protection initiative (klimaaktiv)	Governmental climate initiative
Austrian Institute of Constructional Engineering (OIB)	Public authority
Austrian Society for Environment and Technology (ÖGUT)	NGO and agency
Renowave cooperative	Cooperative of companies in the building refurbishment sector, agency
RM Regionalmanagement Mittelkärnten GmbH	Public authority
Ressourcen Management Agentur GmbH	Partner of Governmental climate initiative
Puterrot GmbH	Designer and professional certifier (company)
e+msa EnergieBeratungs GmbH	Consulting company

Stakeholder	Category
Peak energy GmbH	Consulting company
Builders	Designer and professional certifier (company)
AEE Energy services	Professional certifier
Property management	Property manager, end user
Municipality Arnoldstein	Public authority
Carinthian Provincial Government, Departments 11 and 15	Public authority
Engineering offices, technical experts	Professional certifiers and energy advisors
Housing associations	Property manager, end user
Architectural office RESCHETAR e.U.	Designer and professional certifier (company)
ARCH+MORE ZT GmbH	Architectural firm
SERA global GmbH	Project partner

The decision to bring different stakeholders together to discuss several inextricably linked topics at the same time proved to be effective. The insights gained through the statements and demands from the various target groups created a strong basis for a future vision of the enhanced EPC. At the same time, some of the potential obstacles to be overcome in the eventual implementation of the enhanced EPC were detected in these dialogues. In addition, the federal situation in Austria meant that the workshops had to be held in four different cities, as basic conditions such as certified EPCs and legal provisions are handled individually in each federal state.

Outcomes

It should be noted in advance that the panellists acknowledged the need to distinguish between new buildings and existing ones to be renovated. In other words, the extent to which these two types of buildings can be compared at all or mapped in the EPC.

Furthermore, a certain reluctance of the participants concerning the upcoming national implementation of regulations based on the EPBD recast was detected. An example of this is that several public authorities claimed that they will not adhere to new regulations until they have received clear specifications.

The participants also raised questions about the practical implementation of an improved EPC and several construction-related challenges, such as the use of BIM and the exchange with EPC or the declaration of consumption data for domestic hot water and heating requirements.

A summary of the key issues discussed in the workshops in Austria is summarized next.

Regarding the building Renovation Passport and building logbook:

- The urgent need to distinguish between **existing and new buildings** is emphasized due to the contrast between historic constructions with centuries-long lifespans and new buildings with shorter life expectancies. The Renovation Passport should be equipped to reflect these distinctions. It was recommended to introduce separate building regulations for new and existing buildings under renovation.
- **User-Friendly Renovation Passport**. The Renovation Passport should clearly articulate the goal of decarbonization by 2050. The challenge in real estate management is highlighted, stating that renovations often focus on restoring existing conditions rather than improving them. To enhance user-friendliness, a simple system with a traffic light indicator and regular updates on the implementation of measures is proposed. Visualizing planned improvements and potential cost savings for end-users is crucial. It was recommended to ensure clear communication in the Renovation Passport, incorporating visual aids and adapting data to circular economy principles.
- **Target Group and Renovation Roadmap**. The Renovation Passport, designed for end-users, provides information on current operating costs, planned measures, and the expected reduction in costs/energy consumption. This facilitates obtaining subsidies and favourable conditions from banks. The renovation roadmap, with specific measures and deadlines, ensures accountability. It is recommended that penalties be imposed if targets are not met, with monitoring through the ZEUS EPC database. It was recommended to differentiate roles in energy consulting for single-family homes and multi-storey residential buildings. Define interfaces and levels of detail for Renovation Roadmaps.
- **Renovation Passport and level of details**. Realization planning and detailed planning, including guiding details for window connections, require significant effort. High-quality renovation roadmaps, holding the status of an expert opinion, can play a crucial role in property valuation. Some recommendations were: 1) to recognize the diverse roles of energy consulting in single-family homes and multi-storey residential buildings. Position energy consultants as a preliminary stage to renovation planning, involving engineering offices, civil engineers, and architecture. 2) to establish different levels of detail for the renovation roadmap, such as:
    - Level of detail 1: Energy consulting protocol for single-family homes.
    - Level of detail 2: Property safety inspection in accordance with ÖNORM B 1300 ("Property security inspections for residential buildings - regular inspection routines as part of visual inspections and non-destructive assessments - basics and checklists"), combined with energy audit plus action plan and schedule.
    - Level of detail 3: Technical due diligence inspection, including implementation planning of measures and schedule.
- **Calculation method for** Renovation Passport. Challenges in specifying costs and savings in the Renovation Passport require a system to collect quality-assured cost data. Collaboration with Klimaaktiv and subsidy statements can establish a basis for prices/costs. Recommendations were made to set up a system for collecting prices, collaborate with Klimaaktiv, and design subsidy statements accordingly.
- **Building logbook and databases**. Various options for collecting building data, including BIM Server Center and ZEUS, are discussed. A dynamic EPC, linked to a building database, was proposed for automatic and up-to-date assessments and certificates. It was recommended to explore options for a building logbook, consider automated transfers to ZEUS, and leverage databases effectively.
- The **addition of the Renovation Passport to the EPC** is a valuable enhancement, incorporating specific utilization profiles, consumption values, financing details, and more.
- Integration of Renovation Passport into **existing legislative framework**. Incorporating the Renovation Passport into the current legislative framework has been a key focus. In 2024, the province of Carinthia introduced a funding guideline that outlines the tasks involved in initiating and executing a renovation process, as well as the required qualifications and associated funding. This guideline serves as a promising example for other regions to follow. The responsibilities assigned to energy advisors include developing an energy advisory protocol that incorporates the renovation roadmap. Renovation coaches, on the other hand,

assist homeowners in implementing renovation measures. Professionals seeking to fulfil these roles need to possess a professional engineering license or be associated with an architectural office. Grants are available to support the work of both energy advisors and renovation coaches. Regarding the 2050 target for zero-emission building standards in existing structures, the Carinthian Provincial Government has integrated energy and spatial planning topics. They are actively working on a spatial information system to enhance data on renewable energy sources and assess district heating possibilities in refurbishment concepts.

About the use of BIM in building assessment and certification:

- Opinions regarding BIM vary, spanning from acknowledging its complexity to recognizing its potential for facilitating networked and efficient work processes. Simplifying BIM tools to enable widespread adoption is suggested, with a focus on ensuring legal clarity. Recommendations include the development of user-friendly BIM tools that specifically address legal concerns.

Regarding funding and financial schemes:

- **Funding for stepwise renovation was emphasized**, with adherence to renovation roadmap deadlines and mandatory monitoring. Linking funding to consumption data was proposed, with approval based on the Renovation Passport and roadmap. Recommendations were made to align funding with Renovation Passport and roadmap progress, linking to consumption data.
- **Financing** poses a significant challenge, as even with available subsidies, households often struggle to cover the self-financing portion. Initial funding commitments are contingent on presenting the final invoice, creating hurdles for many households unable to afford the pre-financing. This often leads to the replacement of only the heating system due to simplicity and lower investment costs. To realize the "energy efficiency first" principle in building envelope measures, suitable financing options, such as simultaneous and uncomplicated project realization loans, need to be offered with funding approval (equity replacement loan).
- The funding landscape is complex, involving federal and state support, potential combinations, and evolving regulations.
- Ensuring the continuity of financing measures is crucial for the consistent engagement of companies in building refurbishment, promoting sustainable operation and preventing the need for later staff layoffs, which would be challenging to reverse.

And about qualification of experts:

- The expanded scope of the new EPC demands **expertise** across multiple disciplines, including building services, renewable energy, building automation, building physics, materials science, architecture, health, and life cycle assessment. This level of expertise may exceed the capacity of an individual to maintain the requisite quality. Collaboration among several small companies with diverse specializations might be necessary, sharing data and calculation results in a building database. From this database, various assessments such as energy performance certificates, klimaaktiv, and refurbishment measures could be obtained.

3.2 Croatia

Date and location

The workshop was organized on 15th November 2023 in the premises of the company EKONERG as EIHP is being refurbished, with the involvement of some local key stakeholders (Figure 3).

Figure 3. Snapshots of the workshop in Croatia

Topics addressed

The workshop aimed to facilitate a discussion on the new set of indicators and procedures linked to the EPBD recast in connection with the EPC.Each presentation was followed by an active discussion in order to get feedback from the audience.

The topics discussed were the following:

- BIM as a data set for generating EPCs
- SRI structure and functionalities
- Level(s) sustainability indicators
- Examples of SRI application in TIMEPAC

Stakeholders

The stakeholders participating in the workshop and their profiles are shown in Table 3.

Table 3. Stakeholders attending the workshops in Croatia

Stakeholder	Category
HEP ESCO	Energy service company
REGEA	Energy agency
APN	Real estate agency
Energonova	Professional certified
STUDIO M2	Professional certified
Ministry of Physical Planning, Construction and State Assets	Public authority

Outcomes

The main findings focus on how Building Information Modelling (BIM) is used in Croatia. It turns out that BIM can be really helpful, especially in new construction projects. However, in Croatia, it's not used consistently. Mostly, it's just architects working on specific new building designs who use it.

Although BIM can improve data accuracy and help experts collaborate better, one big problem is the high cost involved.

The main challenge is not that people do not know how to use BIM tools. It is more about different tools not working well together, interoperability issues which need to be fixed. There is potential in aligning data with real consumption and usage patterns to develop optimization models.

3.3 Cyprus

Date and location

The workshop took place at the Oikodomos Education Centre in Nisou Area, Cyprus (Figures 4 and 5), on November 30th , 2023, and was organised by representatives from the Cyprus Energy Agency (CEA) and the Cyprus University of Technology (CUT). This centre provides high-quality education and training programmes specifically designed for professionals in the construction industry. Its goal is to equip participants with the essential skills for career advancement and success. Moreover, the centre is dedicated to certifying workers in Standard Occupational Qualifications.

Figure 4. View of the Oikodomos Education Centre

Figure 5. Snapshots of the workshop in Cyprus.

Topics addressed

The primary objective of the workshop was to foster meaningful dialogue regarding the potential introduction of a new set of indicators, evaluating their applicability within the stakeholders' realms.

The main topics discussed with the workshop participants were:

- How can BIM data be effectively utilized to enhance EPCs and provide detailed information about building systems and components?
- What challenges and opportunities arise from integrating operational data into EPCs to improve accuracy and offer real-time information on building energy use and performance?

- In what ways can advanced analysis techniques be employed to identify opportunities for energy savings and optimize building operations based on enhanced EPC data?

Stakeholders

The stakeholders participating in the workshop and their profiles are shown in Table 4.

Table 4. Stakeholders attending the workshops in Cyprus

Stakeholder	Category
Cyprus Scientific and Technical Chamber (ETEK)	Professional association
The Human Resource Development Authority of Cyprus (HRDA)	Human resources
KNAUF (and other companies/material manufacturers related to energy efficiency upgrades)	Building material producer
Universities in Cyprus (UCY, Frederick etc.)	Academia
VET providers (KES college, Intercollege, UCLAN)	Academia
PASEKSEE (Association of Energy Efficiency Businesses)	Professional association
OEB – Employers and Industrialists Federation	Professional association
KEPA	Productivity centres
ACEEME – Mechanical Engineers	Professional certifiers
SPOLMIK – Civil Engineers	Professional certifiers
Cyprus Architects Association	Professional certifiers
Cyprus University of Technology	Project partner (Academia)
Cyprus Energy Agency	Project partner (Energy agency)

Outcomes

During the course of the discussion, various factors influencing the sustainability of buildings were addressed, with specific focus on considerations for people, the economy, and environmental impacts.

Regarding the role of public administrations in managing the building stock:

- Emphasis was placed on the necessity for clear and easily understandable language to raise public awareness about building rehabilitation.
- The importance of administrations in managing building databases, ensuring openness, accessibility, and reliability, was highlighted. Additionally, simplifying administrative processes and establishing single points of access were identified as crucial measures.

Regarding end-users:

- They expressed a desire for a certificate of their building that is accurate and reliable in its information, providing true value for their property and serving as a benchmark for targeted energy upgrades. Furthermore, they highlighted the significance of considering "hidden" or non-quantifiable benefits such as thermal comfort in the decision-making process for potential upgrade investments.

3.4 Italy

Date and location

The workshop, held on December 1, 2023, in Milan, was a collaborative effort between Edilclima, Regione Piemonte, and Politecnico di Torino. It received support from various stakeholders and took place in a co-working space near the Milano Centrale railway station (Figure 6, and 7). The venue was chosen with the aim of engaging numerous prominent architectural and engineering firms in Milan that are experienced in utilizing BIM procedures.

Figure 6. View of co-working office in Milano in which the workshop took place (Source image: Zanon Gabriele Photography - www.gabrielezanon.com).

Figure 7. Snapshots of the workshop in Italy

Topics addressed

The workshop was intended to discuss the concept of the Renovation Passport outlined in the proposed version of the recast of EPBD of March 2023 as well as in the report of the Building Performance Institute Europe (PBIE). According to these definitions, the renovation passport is composed of a renovation roadmap and the building logbook. The former is a proposal of staged renovation scenarios together with the assessment of the building performance after each renovation step. The latter is a repository in which all the information about the building that is stored online is gathered and collected for building owners.

The presentations were the following:

- Politecnico di Torino provided a preliminary introduction to the TIMEPAC project, contextualizing it within the main topics of the EPBD recast.
- Edilclima led a discussion on the Renovation Passport, outlining key topics to stimulate audience engagement and gather feedback.
- ENEA presented the Italian Renovation Passport and building logbook, showcasing the Italian PNPe2 portal.
- iiSBE shared insights from the EUB SuperHUB project, highlighting synergies with TIMEPAC.
- Politecnico di Torino discussed the importance of data availability and accuracy, particularly concerning the BIM approach.
- Graphisoft presented their BIM technology.

Stakeholders

The stakeholders came from several sectors, but the majority were consulting firms that are mainly devoted to the designing of the buildings and technical power plants.

All participants were very curious and proactive in the discussion, which were generated between the presentations.

A list of the institutions that participated in the workshop is presented in Table 5.

Table 5. Stakeholders attending the workshops in Italy

Stakeholder	Category
Ai Engineering R&D	Consulting firm
Ariatta Ingegneria dei Sistemi	Consulting firm
ASSOBIM	Sectorial association
C2R Energy Consulting	Consulting firm
Edilclima	Project partner
ENEA	Research institution
Energysave	Consulting firm
GBC Italia	Sectorial association
General Planning	Consulting firm
Graphisoft Italia	Software firm

Stakeholder	Category
iiSBE Italia	Research institution
Politecnico di Torino	Project partner
Rethink Energy	Consulting firm
Seingim	Consulting firm
110ebonus	Consulting firm

Outcomes

The main outcomes and feedback from the discussion are listed below.

About the building Renovation Passport and building logbook:

- Many questions were raised on how to **collect data** in order to avoid data losses, when speaking about Renovation Passport and building logbook. Often, a lot of information is needed in several formats. There is a need of tools/procedures to keep track of the buildings through their life cycle.
- Talking about the **Italian national portal** that will host the Renovation Passport, there are issues related to data to be gathered. At the moment, ENEA will only use the EPC database, even if there are many other documents that in principle could be used to extrapolate important information (i.e. certified start of work communication, the energy audit report). The problem is that these documents are not codified using a common language (while APE format in Italy is xml), therefore their interoperability is nowadays limited.

Regarding the use of BIM for energy performance assessment and certification:

- **Data reliability** is a key aspect. There is a risk of considering reliable and certain the information in 3D BIM models, which often rely on assumptions that are, in fact, false certainties. Once a BIM model is presented, there is the impression that the data is always correct, but that is not the case. The importance of being aware, not only of the data itself but especially of its reliability level, is discussed.
- There is the need of optimizing and **unifying** several **existing tools**, for better interoperability. For example, using the IFC format for connecting the architectural model with the energy model.
- The possibility of using BIM also to calculate the sustainability indicators was questioned. It is not always possible because once the architectural model is created from BIM, if the .ifc is used for exporting data, not all information of the model is maintained and some information (maybe used for the calculation of sustainability indicators) is lost.
- BIM risks being exclusive and not inclusive. There should be **simpler options for small professional firms**, while more complex tools can be considered for larger professional studios. This also applies to the data collection aspect. It is not realistic to apply BIM for all professionals at all levels and for every type of building.
- There is a need to **simplify the procedure** and software based on specific objectives. For energy analyses, for example, an .ifc model from Edilclima with only the necessary information is sufficient. In any case, someone who can interpret the data and information is needed.
- We need to focus on existing buildings, which are the real core of the problem.

And concerning experts' qualification:

- A **significant knowledge gap** exists within both professional circles and public authorities. Continuous digitalization and document updating are essential, yet many documents remain in outdated formats, and technicians lack adequate training in this regard.

3.5 Slovenia

Date and location

On the 14th of November 2023, a workshop was held in Ljubljana at the Ministry of the Environment, Climate and Energy, focusing on the TIMEPAC project and the recent updates in the Energy Performance of Buildings Directive (EPBD). The workshop was organized by the Ministry of the Environment, Climate, and Energy with the participation of several interested stakeholders (Figure 8).

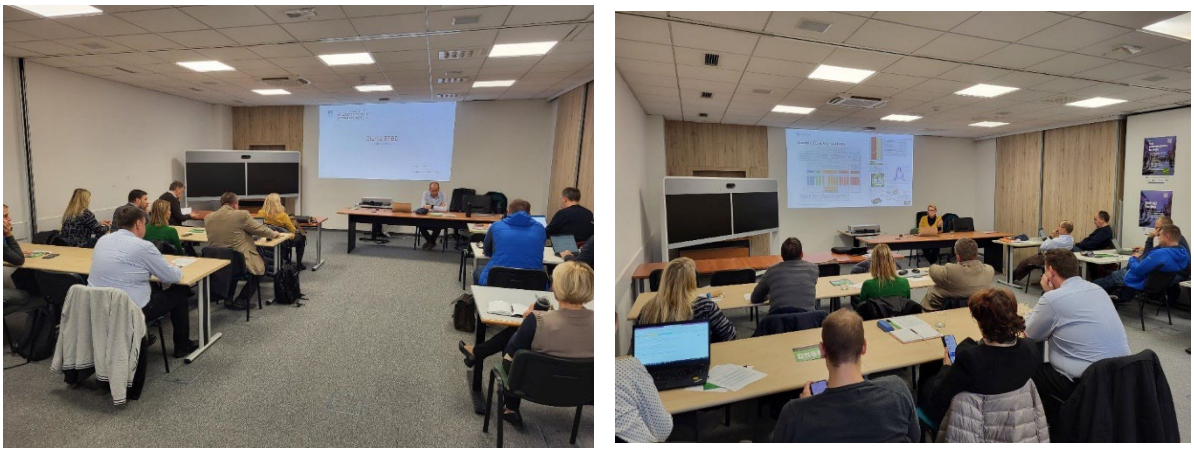

Figure 8. Snapshots of the workshop in Slovenia

Topics addressed

The workshop was structured in the following sections:

- An overview of the TIMEPAC project and its relevance to the updated EPBD. This included a discussion on the current state of Slovenian legislation concerning building energy efficiency and the development of new laws.
- The Smart Readiness Indicator (SRI) for buildings, presented by the Jožef Stefan Institute, emphasizing their importance in modern standards and their integration with TIMEPAC's objectives.
- The process of conducting energy audits and the development of the building Renovation Passport to guide and record building upgrades.
- The dynamic methods for calculating building energy use, compared to static models to highlight the benefits, presented by the University of Ljubljana.
- The sustainable renovation strategies with a detailed look at the Building Passport concept, which is crucial for documenting and guiding energy-efficient renovations, was presented by the ZRMK Building and Civil Engineering Institute.

Stakeholders

The stakeholders participating in the workshop and their profiles are shown in Table 6.

Table 6. Stakeholders attending the workshops in Slovenia

Stakeholder	Category
PETROL	Energy service company
ZEUS ENERGIJA	Professional certified
GOLEA	Energy agency
LEAG	Energy agency
KNAUF INSULATION	Construction company
ZAPS	Professional associations
ZRMK	Research institutions
IJS	Research institutions
UL FS	Research institutions
TELEKOM SLOVENIJE	Energy-related Product Company

Outcomes

Based on the discussions, the following conclusions can be drawn.

About building Renovation Passport and building logbook:

- The Ministry's acknowledgement of **data availability** as a fundamental requirement signifies a progressive step towards a more data-driven approach in the energy sector. The emphasis on establishing an extensive database for managing spatial energy-related data is commendable. It shows a forward-thinking attitude that aligns with global trends towards big data and analytics in energy management.
- The workshop effectively communicated the challenges and heightened standards introduced by the EPBD recast. It underscored the complexity and rigour that will now be involved in obtaining Renovation Passports and EPCs. This recognition is vital for setting the stage for the necessary adjustments in the industry.
- A major takeaway was the urgent need to establish a **comprehensive database for spatial energy data**. This infrastructure will be the backbone for conducting accurate energy audits, issuing EPCs, and assessing SRIs. The envisioned database should not only store data but also facilitate easy access and efficient management, ensuring that data drives decision-making and policy development.

About the qualification of the experts:

- The shortage of qualified professionals capable of meeting the EPBD recast standards is a wake-up call. There's a clear and present **need for** enhanced and intensive **training programmes** tailored for energy professionals. These programmes should not only cover the technical aspects of producing BRPs and EPCs but also instil a deep understanding of the EPBD, its objectives, and its implications for building energy efficiency.
- Stakeholders must be prepared for more stringent processes in obtaining BRPs and EPCs. This shift calls for a proactive approach, where architects, engineers, and energy auditors

familiarize themselves with the new standards well in advance. Preparation will be key to ensuring a smooth transition to these more demanding requirements.

- Addressing the challenges highlighted in the workshop requires a concerted effort from various sectors. Government bodies, educational institutions, industry associations, and professionals must collaborate to develop the necessary database infrastructure, design and deliver comprehensive training programmes, and ensure a seamless adaptation to the new standards.
- As these new measures are implemented, continuous monitoring and feedback mechanisms should be in place to assess their effectiveness, identify any issues or bottlenecks, and make necessary adjustments. This adaptive approach will be crucial in ensuring that the objectives of the EPBD and the broader goals of energy efficiency and sustainability are met.

In conclusion, the workshop has shed light on significant challenges and areas of need in the realm of building energy efficiency. It has set a clear path forward, emphasizing the importance of data infrastructure, the need for skilled professionals, and the necessity of a collaborative and adaptive approach. The insights gained from this session are not just a reflection of the current state but also a blueprint for future action. As stakeholders in the energy sector, it is important to take these learnings and translate them into concrete actions that will boost the transition toward a more energy-efficient and sustainable future.

3.6 Spain

Date and location

The workshop took place on 20th October 2023 at the headquarters of ICAEN, in Barcelona. The coordinating team ICAEN, alongside Spanish partners CYPE and FUNITEC, carried out the workshop (Figure 9).

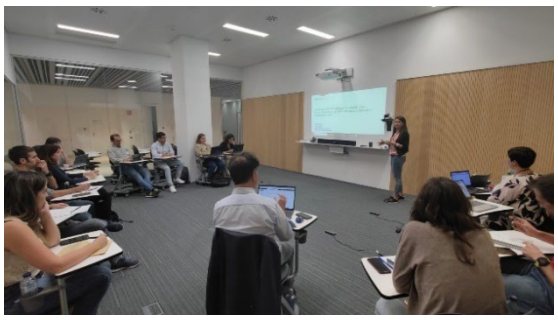

Figure 9. Snapshots of the workshop in Spain

Topics addressed

The workshop was divided into two parts:

1. Integration of the energy certificate with the BIM methodology
2. Integration of the Smart Readiness Indicator, Level(s), and the building Renovation Passport with the EPC

To activate a debate, after each section, a question was raised from the speakers:

- In the first part, Álvaro Sicilia (Funitec – La Salle) and Benjamin González (CYPE) raised the question: What could be the future energy certificate with BIM?
- In the second part, Ainhoa Mata and Marta Chàfer (ICAEN) presented the following question: How can we relate energy certificates to SRI and Renovation Passports?

The workshop started with ICAEN providing a comprehensive overview, laying the groundwork for La Salle to introduce the TIMEPAC project. Subsequently, La Salle and CYPE delved into the use of BIM models to enhance the EPC. ICAEN shared insights into Level(s) sustainability indicators and SRI, illustrated with a Barcelona case study integrating both indicators. The presentation also included an overview of the Renovation Passport within the framework of the EPBD recast.

After the presentations, a productive one-hour discussion ensued among all participants. The conversation centered on the newly proposed indicators and their practical implications for stakeholders' activities.

Stakeholders

Seventeen professionals from the construction sector, specializing in energy certification, as well as public administration, participated. Their profiles and organizations are listed in Table 7.

Table 7. Stakeholders attending the workshop in Spain

Stakeholder	Category
JSS	Professional certified
IMHAB	Regional and local public authority
Societat Orgànica	Professional certified
ARCbcn	Professional certified
Agència de l'Habitatge de Catalunya	Regional and local public authority
Proisotec	Energy auditor
AiguaSol	Energy auditor
Oficina Tècnica de Rehabilitació	Regional and local public authority
ICAEN	Project partner
FUNITEC	Project partner
CYPE	Project partner

Outcomes

Throughout the discussions with the stakeholders, various considerations emerged.

About using BIM for energy performance assessment and certification:

- The use of the BIM methodology can help to **improve the quality** of certificates and reduce inconsistencies among different documents for the same building. However, using BIM requires more time and, therefore, an increase in cost compared to other certification tools.
- It was proposed that the government conduct a simple simulation of all the buildings in a municipality or region, serving as a foundation and complemented by more detailed simulations commissioned by property owners for rehabilitation projects, the BRP, etc. Building Renovation Passports and a digital building logbook are two instruments proposed by the EPBD recast in which BIM can play a role. BIM has the potential to support the implementation of Renovation Passports by serving as a **repository of comprehensive data** that facilitates the calculation of key building performance indicators at all stages.
- Although creating a BIM solely for an Energy Performance Certificate may not always be considered worthwhile due to the additional time required, the efforts are justified when BIM is part of a Renovation Passport. Reusing BIM data for these purposes increases the importance of investing time and resources in creating and maintaining BIM models, ultimately driving the adoption of BIM technology in the field of energy performance assessment.
- When used properly, BIM could help **avoid inconsistencies** between documents for the same building (energy certificate, technical building inspection, certificate of habitability, etc.).
- The variation in the **level of detail** being used to analyse the building often results in different simulations depending on the analysis objective (structure, installations, energy

simulation, etc.) and the required level of definition (energy simulation for the entire building or a single space). The level of detail in the model (BIM or other) should correspond to the simulation tools; objectives and models need to be aligned.

- When considering proposed methodological changes, it is crucial to **prioritize the involvement of individuals**. A Renovation Passport can serve as motivation to uphold and manage data over time, thereby facilitating the integration of Building Information Modelling into a business model. It is imperative to engage all stakeholders throughout the entire construction and building use phases. Regarding administration, the focus should be on enhancing quality with minimal controls. For construction companies, there should be an emphasis on improving training, while technical personnel should undergo mandatory minimum training. Property management acts as the pivotal connection between administration and ownership, ensuring seamless coordination. Owners and users need access to information outlining their responsibilities, proper building usage, and rehabilitation measures, presented in straightforward terms.
- Another critical aspect to address is the **management of data**. This responsibility could be distributed among actors involved. Property owners bear the responsibility of preserving both the building and its associated data. A public institution could take on the role of registering, storing, and managing data to ensure quality and facilitate consultation throughout the entire design, construction, and usage process, including maintenance and renovations. Additionally, there may be designated individuals responsible for overseeing the BIM tool over time, such as an energy manager or building maintenance personnel.

Concerning the building Renovation Passport and digital building logbook:

- To foster a rehabilitation-oriented culture, it is crucial to emphasize the importance of **maintaining buildings**. Considering current regulations, the passport could evolve from existing certificates or Technical Building Inspections (i.e. ITE) encompassing aspects beyond just energy considerations.
- Renovation passports serve as a tool for achieving comprehensive rehabilitation, aiming for zero-emission buildings in various stages. Despite similarities between renovation passports and building logbooks, the passport extends beyond energy considerations.
- Economic challenges are tackled through rehabilitation **grants, tax incentives**, and improved access to financing. The complex rehabilitation process is streamlined through administrative simplification, a one-stop-shop approach, and the voluntary nature of rehabilitation.
- The building Renovation Passport is voluntary, aligning with the proposed minimum energy qualifications for buildings outlined in the EPBD draft. In Spain, the **existing building book** exists (“libro del edificio”) as outlined in EPBD recast, and it is a document that must include the energy certificate, the user manual, maintenance instructions, among other information. This book can serve as a bridge, a way of connection with the future digital building logbook. It was discussed that this logbook could be a repository to store all the documents related to a building (e.g. EPC, Smart Readiness Indicator calculation etc.) while existing building books can facilitate the Renovation Passport implementation.
- The **involvement of stakeholders** is essential. Ownership presents a challenge as society has not fully embraced the idea of regular building maintenance.

And regarding data quality:

- Ensuring the certificate's quality is contingent upon effective training. It is imperative to provide **comprehensive training** for energy advisors, extending beyond mere data entry skills for technicians. The training should encompass a broader scope, including the environmental impacts of buildings throughout their entire life cycle. Equally essential is the comprehensive training and information dissemination to all stakeholders involved in the process, including owners, administration, technical personnel, property management, and construction companies.

4 Participation

In the workshops organized across the consortium countries, a total of 136 stakeholders from various profiles were engaged (Table 8). The majority of the invited audience were "Professionals": engineers and architects, both freelancers and those affiliated with design firms, as well as energy certifiers. The "Others" category encompasses stakeholder groups not categorized in the exploitation plan. This category includes industry associations, universities, and research centres, primarily.

Table 8. Workshop participants per country distributed by target groups

	Austria*	Croatia	Cyprus	Italy	Slovenia	Spain	Total
Professionals	4	3	5	10	3	7	32
Public bodies	3	3	2	1	1	3	13
Market operators	3	2	2	2	3	1	13
Others	2	-	2	5	12	-	21
Project partners	2	4	7	29	9	6	57
Total	14	12	18	47	28	17	**136**

*The total number of external participants for the four Austrian workshops is 48 (excluding participating project partners), divided among the four Verification Scenarios for statistical purposes.

5 Findings and conclusions

In this section, a summary of the outcomes in each country is presented, referring to the BIM approach, the Renovation Passport and the building logbook. Furthermore, the feedback of interest for the TIMEPAC Academy, to better guide the content of the lessons, is matched to the relevant Training Scenario (TS).

BIM application in building performance assessment and certification

In **Austria**, opinions ranged from acknowledging its complexity to recognizing its potential for streamlining work. Simplifying BIM tools for widespread use is recommended, emphasizing the need for legal clarity. It was recommended to develop user-friendly BIM tools, addressing legal concerns.

In **Croatia**, the interest focused on the promising advantages that BIM brings, particularly in the domain of new construction projects. However, its integration in Croatia is inconsistent, predominantly limited to architects engaged in specific new building designs. While BIM has the potential to enhance data validation and foster collaboration among experts, a notable obstacle is the significant cost involved. The challenge does not stem from participants' unfamiliarity with BIM tools but rather revolves around the broader issue of interoperability among different tools, necessitating resolution. The prospect of aligning data with actual consumption and usage patterns holds promise for the development of optimization models.

In **Italy**, discussions took place around the reliability of data housed in 3D BIM models. The conversation expanded to the existing tools, emphasizing the need for optimization and unification to enhance interoperability. BIM's potential role in calculating sustainability indicators is explored, but obstacles arise when exporting data, leading to potential information loss. There is the need for simple tools, particularly for less skilled professionals with a focus on procedures for existing buildings, which are the core of the problem.

In **Spain**, the TIMEPAC team advocates the use of BIM methodology to enhance certificate quality, aiming to reduce inconsistencies in building documentation. Despite the acknowledged benefits, BIM implementation involves increased time and cost compared to other certification tools. Government-led simulations of buildings in municipalities or regions were proposed, complemented by more detailed simulations for rehabilitation projects, building Renovation Passports and digital building logbooks. BIM's role in supporting these initiatives was highlighted, serving as a repository for comprehensive data that aids in calculating key building performance indicators.

The lack of standardization in this working methodology poses challenges in information sharing among professionals. Addressing this, the involvement of all stakeholders throughout the construction and building use phases is crucial, with a focus on improving training for construction companies and technical personnel.

Renovation Passport and building logbook

In **Austria**, the discussions focused on the critical need to distinguish between existing structures with centuries-long lifespans and newer constructions. The Renovation Passport is seen as a crucial tool, but it was recommended to introduce separate building regulations for new and existing buildings to refer to their unique characteristics. The emphasis on a user-friendly Renovation Passport is significant, with suggestions for clarity, simplicity, and regular updates. Targeted renovation roadmaps for end-users and different levels of detail were proposed to enhance accountability and property valuation. Challenges in specifying costs and savings underscored the need for a robust system to collect quality-assured cost data.

In **Italy**, questions arose about the practicalities of data collection for the Renovation Passport, emphasizing the challenge of avoiding data losses. The national portal's issues with data gathering were discussed, particularly the reliance on the EPC database. The lack of a common language for codifying various documents caused obstacles. There's a recognized need for tools and procedures

to track buildings throughout their life cycle, highlighting the importance of efficient data management.

In **Slovenia**, the focus was on establishing an extensive database for managing spatial energy-related data that aligns well with global trends in big data and analytics for energy management. The workshop highlighted the challenges and heightened standards introduced by the new EPBD, emphasizing the need for a comprehensive database. This infrastructure is envisioned to support accurate energy audits, issuance of EPCs, and the assessment of Smart Readiness Indicators. It reflects a forward-thinking attitude in leveraging data for informed decision-making and policy development.

In **Spain**, there is a strong emphasis on fostering a culture of rehabilitation and maintenance for buildings. Spain is actively addressing economic challenges in rehabilitation through grants, tax incentives, and improved financing access. The voluntary nature of the building Renovation Passport aligns with the proposed energy qualifications outlined in the EPBD. The existing digital building logbook serves as a bridge, connecting with the future building Renovation Passport. Stakeholders' involvement is recognized as essential, with a need to raise awareness and enforce regulations for building maintenance. The role of the digital logbook and existing building books in facilitating the implementation of the Renovation Passport was discussed.

Insights for training activities

- **BIM complexity:** Opinions on BIM range from acknowledging its complexity to recognizing its potential for efficient work. Simplifying BIM tools for widespread use is recommended. Challenges discussed include the potential exclusivity of BIM, especially for smaller professionals. Calls for simplification, particularly for existing buildings. BIM offers potential advantages, especially in new construction projects, but its integration is inconsistent. Architects mainly adopt it for specific designs, and cost is a significant obstacle. The reliability of data in 3D BIM models should be taken into account, emphasizing the need for optimization and unification of tools for better interoperability.
- **Interoperability challenges:** Emphasis on optimizing and unifying tools for improved interoperability, including the use of the .ifc format for connecting architectural and energy models.
- **Standardising procedures:** BIM is not just a tool but a working methodology, and there's a need for standardization in sharing data among professionals.
- **Stakeholder engagement:** Prioritizing stakeholder involvement is crucial for proposed methodological changes. The utilization of a renovation passport can motivate data management and integrate BIM into business models.
- **Renovation Passport for new and old buildings and building maintenance:** It was emphasized the need to distinguish between existing and new buildings in Renovation Passports, considering the contrast in lifespans. There is also the need to emphasize the importance of maintaining buildings and Renovation Passport could help.
- **Renovation Passport and level of detail:** It is important to explore different levels of detail for the Renovation Passport, recognizing diverse roles in energy consulting for various building types.
- **Renovation passport and building logbook:** Importance was highlighted in the data collection process to avoid losses in Renovation Passports and building logbooks, emphasizing the need for tools to track buildings throughout their lifecycle. The importance of data availability and the establishment of a comprehensive database for spatial energy data was also stressed. Besides, it was pointed out the issues related to data gathering for the national portal hosting the Renovation Passport, highlighting the need for a common language in document codification.

- **User-friendly** Renovation Passport**:** Recommendations were provided for a user-friendly Renovation Passport, articulating decarbonization goals, using visual aids, and providing regular updates for end-users.
- **Financial schemes:** There is a complex funding landscape for renovations, highlighting the challenges of financing and the need for suitable financing options. There are economic challenges through rehabilitation grants, tax incentives, and improved access to financing.
- **Stakeholder involvement:** The role of stakeholder involvement in fostering a rehabilitation-oriented culture, raising awareness, and enforcing regulations was considered essential.
- **Funding and monitoring:** Austria emphasizes the need for funding for stepwise renovation, aligning with Renovation Passport progress, and linking it to consumption data. It is also important to set an ongoing monitoring and feedback mechanisms to assess the effectiveness of new measures, identify issues, and make necessary adjustments. An adaptive approach is crucial to meeting the objectives of the EPBD and broader energy efficiency and sustainability goals.
- **Expertise and collaboration:** There is the need for expertise across multiple disciplines to meet the expanded scope of the new EPC. Collaboration among small companies with diverse specializations and data sharing in a common building database is recommended.
- **Training and education:** There is a lack of qualified professionals under the new EPBD standards, stressing the need for enhanced and intensive training programmes for energy professionals. Importance was given to comprehensive training for energy advisors, extending beyond data entry skills. The training should cover a broader scope, including the environmental impacts of buildings throughout their entire life cycle. It is essential for all stakeholders involved in the process.
- **Collaborative efforts:** There is a necessity for collaborative efforts among government bodies, educational institutions, industry associations, and professionals to develop database infrastructure, deliver comprehensive training programmes, and facilitate a smooth transition to new standards.