D5.9 – After-LIFE Conservation Plan v2

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	PP = Restricted to other programme participants (including the EC)
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Author/s	ED
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ABREVIATIONS

CINEA	Climate, Infrastructure and Environment Executive Agency
EC	European Commission
EPB	Energy Performance of Buildings
EPBD	Energy Performance of Buildings Directive
EPC	Energy Performance Certificate
SRI	Smart Readiness Indicator
ESCO	Energy Service Company
EU	European Union
API	Application Programming Interface
BIM	Building Information Modelling
NBRPs	National Building Renovation Plans
GDPR	General Data Protection Regulation
KPI	Key Performance Indicator
MEPS	Minimum Energy Performance Standards
BMC	Business Model Canvas
VPC	Value Proposition Canvas
ESG	Environmental, Social, and Governance
PaaS	Platform-as-a-Service
SWOT	Strengths, Weaknesses, Opportunities, Threats

PARTNERS SHORT NAMES

Partner No.	Short Name	Full Name
1	**ED**	European Dynamics
2	**QUE**	QUE TECHNOLOGIES
3	**EUP**	EUPHYIA-TECH
4	**SBC**	SBCGR (Sustainable Buildings Council Greece)
5	**EPBC**	EPB CENTER
6	**ENERSAVE**	EnerSave Capital
7	**EU.BAC**	EU Building Automatization Controls Association
8	**EGC**	European Green Cities
9	**ENEFEU**	Energy Efficiency for Europe

About openBEP4EU

*The **openBEP4EU** project is co-funded by the European Union under Grant Agreement No. 101167613 (Life Programme). The project started as of September 1st, 2024, and is anticipated to conclude in March 2027 (30 months duration).*

The building sector is recognised as one of the pillars for achieving the target of European climate neutrality by 2050. The EU is undergoing a twin transition, a digital and green transition as outlined in recent European directives. Buildings are a significant contributor of emissions, and they consume a sizeable portion of EU's energy consumption. Towards EU's direction of improving the performance of its building stock, Energy Performance Certificates (EPCs) have, among other initiatives and actions, been instrumental in achieving the set targets. EPCs have become a powerful tool for the end-users, such as service providers who can identify business opportunities, or policymakers who are empowered with better data on the building stock, enabling them to oversee the effects of policies and financial schemes.

A more harmonised European calculation methodology for the EPCs could, among others, increase comparability between regions, trust, and market uptake for features related to smart readiness, comfort, real energy consumption, and district energy. To this end, OpenBEP4EU aims to deliver an open-source, universal software implementation of the EN ISO 52000 standards family, namely the EU Kernel EPC Engine, to facilitate simultaneous and coordinated adoption of an innovative EPC calculation approach among all the Member States. This initiative aims to make building performance data easily accessible to various stakeholders like financial institutions, energy service providers, and building owners, fostering the development of financial products supporting sustainable renovation projects.

Core elements of openBEP4EU's activities also include the creation of an EPC Support Team to drive market adoption as well as a Sustainable Design Data Hub, aligned with the overarching goals of the European Bauhaus initiative, that not only serves as a data repository but also promotes collaboration and research for sustainable architecture and design. These activities will facilitate stakeholder engagement, contribute to improved EPC reliability, accuracy, accessibility, while paving the way for EPC market uptake across the EU Member States though well promotion strategies. All data sharing within this framework adheres to the principles of the Common European Energy Data Space, prioritizing sovereign data sharing and respecting data ownership among the involved stakeholders.

Executive summary

This deliverable presents the second version of the After-LIFE Conservation Plan for the OpenBEP4EU project. It outlines the strategy for the long-term sustainability, governance, exploitation, and market uptake of the project's results beyond the end-of-LIFE funding. OpenBEP4EU addresses a critical market challenge: the fragmentation of EPC methodologies, tools, and data ecosystems across Member States. Through its open-source, standards-based Digital Toolbox, the project promotes harmonised energy performance and SRI calculations, interoperability, transparency, and trust, supporting the objectives of the EPBD, the Renovation Wave, and the broader European Green Deal.

The updated conservation plan is built around three core value propositions that define the long-term relevance of OpenBEP4EU. First, the project delivers **harmonised energy performance and SRI calculations** through interoperable calculation engines aligned with the EN ISO 52000 family of standards and the revised EPBD. Second, OpenBEP4EU provides an **open, interoperable, and modular Digital Toolbox**, including APIs, BIM integration capabilities, the Bauhaus Design Data Hub, and secure data-sharing mechanisms that facilitate integration with national EPC ecosystems and future Digital Building Logbooks. Third, the project enhances **trust and transparency in building energy performance data** by providing auditable, consistent, and reliable outputs that support policymaking, renovation planning, sustainable finance, and data-driven decision-making. Together, these value propositions position OpenBEP4EU as a future-proof digital infrastructure supporting the European building sector's green and digital transition.

The sustainability strategy combines open-source availability with value-added services that support adoption and long-term maintenance. Key exploitable results include the EPB and SRI Kernels, Audit Tools, APIs, BIM integration services, the Bauhaus Design Data Hub, the Dataspaces Interface, and supporting documentation and training materials. These assets can be adopted by public authorities, EPC assessors, technology providers, ESCOs, building owners, and financial institutions. Sustainability mechanisms include technical consultancy, integration support, managed hosting, API-based services, training programmes, and participation in follow-up European initiatives. The plan also defines a pathway for market uptake and replication through continued engagement with national authorities, EPC ecosystem actors, technology providers, ESCOs, financial institutions, and the open-source community. These actions will support the adoption of harmonised EPC and SRI methodologies, strengthen interoperability, and facilitate the deployment of Digital Building Logbooks and sustainable finance solutions.

The After-LIFE Conservation Plan establishes the governance and sustainability framework for maintaining and further developing the OpenBEP4EU ecosystem beyond project completion. Through strategic partnerships, open-source collaboration, and alignment with emerging European policies and initiatives, the project aims to support large-scale deployment and contribute to the digital and green transformation of the European building sector.

TABLE OF CONTENTS

ABOUT OPENBEP4EU **4**

EXECUTIVE SUMMARY **5**

1. INTRODUCTION **9**

1.1. PURPOSE AND STRUCTURE OF THE DOCUMENT 9
1.2. DISCLAIMER 9

2. PROJECT RESULTS OVERVIEW **10**

2.1. PROJECT BACKGROUND AND INNOVATIONS 10
2.2. EXPLOITABLE OUTCOMES 11

3. VALUE PROPOSITION **13**

3.1. EVOLUTION OF MARKET NEEDS AND POLICY LANDSCAPE 13
3.2. UPDATED STAKEHOLDER NEEDS AND BENEFITS 14
3.3. REFINED VALUE PROPOSITION FOR OPENBEP4EU SOLUTIONS 15

4. EXPLOITATION AND SUSTAINABILITY STRATEGY **21**

4.1. EXPLOITATION PATHWAYS 21
4.2. BUSINESS AND SUSTAINABILITY MODELS 21
4.2.1. Business and sustainability overview *21*
4.2.2. Consolidated value propositions *22*
4.2.3. Key partners *23*
4.2.4. Key activities *23*
4.2.5. Key resources *24*
4.2.6. Customer relationships *24*
4.2.7. Customer segments *25*
4.2.8. Channels and sustainability mechanisms *25*
4.2.9. Revenue streams and sustainability mechanisms *26*
4.2.10. Cost structure and operational requirements *27*
4.2.11. Sustainability assessment *28*
4.3. BUSINESS MODEL IMPLEMENTATION 30
4.3.1. Implementation case 1: Harmonised EPC and SRI calculation services *30*
4.3.2. Implementation case 2: Delivery of energy efficiency software solutions *31*
4.3.3. Implementation case 3: Enhanced trust and transparency in building energy performance data *31*

5. STAKEHOLDER AND MARKET ENGAGEMENT **33**

5.1. STAKEHOLDER ADOPTION POTENTIAL 33
5.2. ENGAGEMENT OF ACTORS 33
5.3. FEEDBACK AND LESSONS LEARNT 34

6. AFTER-LIFE GOVERNANCE **35**

6.1. GOVERNANCE STRUCTURE AFTER PROJECT COMPLETION 35
6.2. DATA GOVERNANCE AND INTEROPERABILITY MANAGEMENT 35

7. AFTER-LIFE ROADMAP 37

7.1. KEY PRIORITIES FOR THE AFTER-LIFE PHASE 37
7.2. SHORT-, MEDIUM- AND LONG-TERM ACTIONS FOLLOWING PROJECT COMPLETION 37
7.3. FUTURE ADOPTION, REPLICATION AND SCALING OPPORTUNITIES 38

8. REFERENCES 40

LIST OF FIGURES

Figure 1: OpenBEP4EU Value Proposition Canvas 15
Figure 2: OpenBEP4EU Business Model Canvas 22

LIST OF TABLES

Table 1: Exploitable outcomes 11
Table 2: Traceability of value propositions to exploitable outcomes 19

1. INTRODUCTION

1.1. Purpose and structure of the document

The purpose of this document is to present the updated version of After-LIFE Conservation Plan for the OpenBEP4EU project and to define the strategy for the long-term sustainability, governance, exploitation, and market uptake of the project results beyond the duration of LIFE funding. Building on the progress achieved during the project and the experience gained through stakeholder engagement activities, the document outlines how the OpenBEP4EU assets, tools, methodologies, and knowledge will continue to deliver value to the European building sector after project completion.

More specifically, the document analyses the evolving market and policy landscape, identifies the main stakeholder needs and exploitation opportunities, and maps them to OpenBEP4EU's refined value propositions. Emphasis is placed on harmonised EPC and SRI calculations, interoperability, digitalisation, transparency, and data-driven decision-making. The document also defines the business and sustainability models supporting the long-term exploitation of key project outcomes, including the Digital Toolbox, EPB and SRI Kernels, APIs, BIM integration services, and the Bauhaus Design Data Hub. It presents implementation cases, sustainability mechanisms, governance arrangements, and adoption pathways that support market uptake, replication, and scaling.

Finally, the After-LIFE Conservation Plan provides a roadmap for maintaining and further developing the OpenBEP4EU ecosystem beyond project completion, establishing a common framework for the long-term sustainability, exploitation, and impact of the project's results.

The structure of the document is the following:

Chapter 1 introduces the document.
Chapter 2 provides a general overview of the project background and innovations.
Chapter 3 provides updates of the market and the framework, along with the refined OpenBEP4EU value propositions.
Chapter 4 provides insights on the sustainability strategy, business aspects and implementation cases.
Chapter 5 elaborates on the stakeholders and market engagement.
Chapter 6 provides the after-LIFE governance framework.
Chapter 7 concludes the document providing the roadmap with relevant actions, future replication, as well as scaling opportunities.

1.2. Disclaimer

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2. Project results overview

2.1. Project background and innovations

The building sector remains one of the largest consumers of energy in the European Union and is central to achieving the EU's climate neutrality objectives. In response, the European Commission has introduced a comprehensive policy framework including the Energy Performance of Buildings Directive (EPBD), the Renovation Wave, Smart Readiness Indicators (SRIs), Digital Building Logbooks, and related initiatives aimed at accelerating the decarbonisation and digitalisation of the European building stock. Within this framework, Energy Performance Certificates (EPCs) play a pivotal role in supporting renovation planning, sustainable finance, regulatory compliance, and evidence-based decision-making. However, EPC implementation across Member States remains characterised by fragmented methodologies, heterogeneous calculation approaches, varying levels of digital maturity, and limited interoperability. This fragmentation reduces comparability, weakens confidence in building performance data, and limits the effectiveness of EPCs as drivers of renovation and investment decisions.

The target audience of OpenBEP4EU includes a wide range of stakeholders involved in the development, implementation, regulation, adoption, financing, and operation of building energy performance solutions across Europe. These include the European Commission and relevant EU initiatives, national, regional, and local authorities responsible for EPC schemes and EPBD implementation, policymakers and certification bodies, technology providers, software vendors, and third-party developers, building performance professionals and experts, including EPC assessors and SRI evaluators, auditors, and building performance experts, building owners and facility managers, Energy Service Companies (ESCOs), financial institutions and investors, research organisations and standardisation bodies; as well as project partners and future ecosystem contributors. Through these stakeholder groups, OpenBEP4EU supports the adoption of harmonised EPC and SRI methodologies, interoperable building data ecosystems, Digital Building Logbooks, and data-driven approaches that contribute to the digital and green transformation of the European building sector.

To address current market and policy challenges, OpenBEP4EU develops a harmonised, open, and interoperable ecosystem for building energy performance assessment. The project supports the implementation of Digital EPCs and Smart Readiness Indicators while promoting interoperability, transparency, trust, and alignment with European standards and regulatory requirements. Through its Digital Toolbox and supporting services, OpenBEP4EU contributes to the establishment of a common digital foundation for building performance assessment across Europe. The main innovations delivered by OpenBEP4EU include:

- EPB Kernel, a harmonised software engine implementing the EN ISO 52000 family of standards for the calculation of building energy performance indicators, enabling transparent, standardised, and comparable EPC assessments.
- SRI Kernel, a harmonised implementation of Smart Readiness Indicator calculations that supports the integration of smart building functionalities, automation, energy flexibility, and occupant-centric services into building performance assessments.
- OpenBEP4EU Digital Toolbox, an open, modular, and interoperable suite of digital components that combines calculation engines, APIs, dataspaces compliance, interoperability services, BIM integration capabilities, managing secure sharing of data and supporting digital tools within a common ecosystem.
- Building Performance App and Audit Tools, supporting data collection, validation, auditing activities, and building performance assessment processes while facilitating the integration of building information from multiple sources.

- Bauhaus Design Data Hub, providing a shared repository for reference datasets, best practices, technical guidance, benchmarking information, and knowledge exchange, while supporting future Digital Building Logbook and building data ecosystem developments.
- EPC Support Team and capacity-building activities, promoting the adoption of EPCs, SRIs, and OpenBEP4EU solutions through technical guidance, training, awareness-raising, and stakeholder engagement activities.

Together, these innovations contribute to reducing fragmentation in the EPC market, improving interoperability and trust in building performance data, supporting Digital Building Logbooks and sustainable finance initiatives, and strengthening the role of EPCs and SRIs in the digital and green transformation of the European building sector. Through this integrated approach, OpenBEP4EU establishes a scalable and future-proof foundation for harmonised, data-driven building performance assessment across Europe.

2.2. Exploitable Outcomes

The intellectual property holders associated with the individual OpenBEP4EU innovations and exploitable outcomes are summarised in the table below. The project's exploitable outcomes comprise the technical assets, digital tools, methodologies, services, datasets, and knowledge generated throughout the project, together with the stakeholder relationships, collaborative networks, and implementation experience developed during its execution. These outcomes build upon the core OpenBEP4EU innovations, including the EPB and SRI Kernels, the OpenBEP4EU Digital Toolbox, the Bauhaus Design Data Hub, Audit Tools, the Building Performance App, the co-benefits assessment framework, and the associated documentation, support services, and capacity-building activities.

Collectively, these exploitable outcomes provide the foundation for the project's long-term sustainability and exploitation strategy. They support the implementation of harmonised Energy Performance Certificates (EPCs), Smart Readiness Indicators (SRIs), and interoperable building data ecosystems in line with evolving European policy objectives. For each outcome, specific adoption, deployment, replication, commercialisation, and sustainability pathways have been identified to maximise market uptake, address stakeholder needs, and contribute to the digitalisation, interoperability, and decarbonisation of the European building sector beyond the project's lifetime.

Table 1: Exploitable outcomes

Outcome	Partners	Exploitation methods	Indicative beneficiaries
Methodology to manage integration of multiple components for OpenBEP4EU Digital Toolbox	QUE, EUP, ED, SBC	• Consultancy and training service • Technical support and implementation activities	• Technology providers • Third-party developers • National authorities • EPC platform operators
EPB Kernel	QUE	• Implementation and support activities for calculation of energy performance KPIs for buildings and integration with SRI Kernel.	• National authorities • Building performance professionals, including energy assessors • Policymakers • Software developers
SRI Kernel	EUP	• Implementation and support activities for SRIs calculation and integration with EPB Kernel.	• Smart building technology providers • Building performance professionals

			• Policymakers • Building owners
Bauhaus Design Data Hub	SBC	• Provision of repository for building model reference data, best practices.	• Architects • Designers • Researchers • Policymakers • Renovation planners
Building Performance application and interfaces	ED	• Implementation of dataspaces-compliant interfaces and provision of tools which manage secure sharing of data to external entities.	• Building owners • Building performance professionals • Public authorities • Data managers
Audit tools and methodologies	EUP	• Implementation and support activities for handling and getting the data from the building model and user related to the building audit.	• Building performance professionals • Building owners • Compliance officers
EPC Support Team	EPBC, QUE, EUP, SBC EUBAC, EFFIES, ENERSAVE	• Support activities to increase the adoption of EPCs in the market. Provision of comprehensive technical expertise, data analysis capabilities, and engagement of relevant stakeholders, including national public authorities and other end-users of OpenBEP4EU Digital Toolbox components.	• National authorities • Policymakers • Building performance professionals • Building owners • Financial institutions
Training programs and documentation provision	QUE, EUP, ED, SBC	• Comprehensive Open-Source Documentation and Training Kit. • Programs and upskilling initiatives for construction professionals and auditors.	• Construction professionals • Building performance professionals • Developers • Public authorities
Approaches to organise efficient dissemination related to energy sector	EGC, EPB	• Reuse of communication and dissemination approaches, formats and materials developed in OpenBEP4EU for communicating complex building-performance topics to different stakeholder groups. • Application of stakeholder-oriented communication approaches to support awareness, understanding and uptake of project results. • Transfer of communication experience and good practices to future projects and related initiatives in the building and energy sectors.	• Policymakers and public authorities • Building and energy-sector stakeholders • Research and innovation projects • Professional and sector organisations • Communication and dissemination practitioners

3. Value Proposition

3.1. Evolution of market needs and policy landscape

Through the EPBD, the EU aims to achieve a highly energy efficient and decarbonised building stock by 2050, requiring Member States to develop national roadmaps, and targeted actions to support the transition. However, experts agree that ambitious policies on their own are insufficient [1]. However, despite being mandatory across the EU, Energy Performance Certificates (EPCs) are often perceived as administrative compliance tools rather than strategic decision-making instruments, with implementation differences, limited user trust, and concerns regarding reliability and usability hindering their wider market uptake and impact [2] [3].

A major challenge remains the lack of harmonisation of EPC methodologies across the Member States. This fragmentation limits comparability, reduces stakeholder confidence and hinders the effective design of incentive schemes and coordinated actions at both national and EU level.

The demand for automated, BIM-integrated EPC assessment tools is growing as the construction sector increasingly adopts digital workflows [4]. However, most EPC tools remain disconnected from BIM environments, requiring manual data transfer and creating inefficiencies. Integrating BIM with EPC calculations can improve accuracy, reduce administrative burden, and support advanced applications such as renovation planning and lifecycle building performance management.

In parallel, there is growing interest in integrating SRIs and comfort metrics into energy performance assessments to better reflect the evolving expectations of building users, service providers, and policymakers. By complementing traditional EPCs with indicators related to automation, responsiveness, indoor comfort, and air quality, SRIs provide a more comprehensive and user-centric view of building performance, supporting more informed decision-making.

In summary, the market needs addressed by OpenBEP4EU can be summarised as follows:

- Reliable and valuable energy performance calculations that can be leveraged for EPCs,
- Harmonisation of EPC calculation methodologies,
- Centralised and accessible data, usable for energy performance assessment and EPCs,
- Integration of SRIs.

The Renovation Wave, launched in 2020 under the European Green Deal, is one of the EU's flagship initiatives for achieving climate neutrality by 2050. It aims to renovate 35 million buildings by 2030 and significantly increase the annual renovation rate of Europe's building stock, which accounts for around 40% of EU energy consumption and a significant share of greenhouse gas emissions. Beyond decarbonisation, building renovation is increasingly recognised as a strategic instrument for enhancing energy security, reducing energy costs for citizens and businesses, and strengthening the competitiveness of the European construction ecosystem. The initiative is closely linked to the revised Energy Performance of Buildings Directive (EPBD), which provides the regulatory framework for accelerating building renovations through measures such as digital Energy Performance Certificates (EPCs), Minimum Energy Performance Standards (MEPS), Smart Readiness Indicators (SRIs), Digital Building Logbooks and National Building Renovation Plans (NBRPs). Together, these instruments support the decarbonisation and digitalisation of the European building sector insufficient [4].

The revised EPBD is creating a rapidly expanding market for digital EPCs, SRIs and Digital Building Logbooks. As part of the EPBD transposition process, Member States are required to implement digital EPCs using harmonised templates and energy performance classes, improving comparability, interoperability and accessibility of building performance data across Europe. Digital Building Logbooks are emerging as central repositories of building information, integrating EPCs, renovation histories, technical specifications and other building-related

data. In parallel, the Smart Readiness Indicator framework supports the assessment of smart building capabilities and is expected to play an increasingly important role in renovation planning and smart building deployment. The ongoing implementation of these instruments is driving growing demand for interoperable building data platforms, semantic data models, digital infrastructure, data governance services, cybersecurity solutions, advanced analytics, and specialised expertise across the construction, energy, and digital sectors. These developments are laying the foundations for a European digital building ecosystem capable of supporting data-driven renovation and investment decisions [4].

The Renovation Wave is also creating significant opportunities for Energy Service Companies (ESCOs) and green finance providers. ESCOs are expected to play a key role in delivering energy renovations through Energy Performance Contracting, enabling building owners to finance upgrades through future energy savings. At the same time, standardised digital EPCs, SRIs and Digital Building Logbooks provide reliable performance data that can support green loans, sustainability-linked investments, renovation mortgages and other performance-based financing schemes. Backed by EU funding programmes and private investment, the Renovation Wave seeks to address an estimated annual building renovation investment gap of approximately €165 billion. The combination of robust building data, smart renovation services, innovative financing mechanisms, and growing collaboration between ESCOs and financial institutions is expected to strengthen the business case for energy renovations, facilitate market uptake, and accelerate the transformation of Europe's building stock [4].

3.2. Updated stakeholder needs and benefits

The implementation phase of the revised Energy Performance of Buildings Directive (EPBD) has intensified creating new requirements and opportunities for stakeholders across the building sector. As Member States prepare the transposition of the EPBD, deploy digital Energy Performance Certificates (EPCs), develop National Building Renovation Plans (NBRPs), and establish Digital Building Logbook infrastructures, the need for reliable, interoperable, and accessible building performance data has become increasingly evident. In this evolving context, OpenBEP4EU continues to create value by supporting the digitalisation and harmonisation of building energy performance assessment processes and by facilitating the integration of building-related data across the European building ecosystem.

Technology providers and software developers increasingly require interoperable data models, standardised interfaces, and common semantic frameworks that allow seamless integration between BIM environments, EPC calculation tools, Digital Building Logbooks, smart building systems, and data spaces. OpenBEP4EU contributes by promoting interoperability and reducing technical barriers to data exchange, enabling the development of innovative digital services and scalable software solutions.

Building performance professionals and experts, certification bodies, and public authorities face growing responsibilities related to the implementation of digital EPCs, building renovation policies, and monitoring obligations established under the revised EPBD. These stakeholders benefit from improved data consistency, higher transparency, and more harmonised approaches to energy performance assessment, facilitating more reliable EPC generation, policy implementation, and compliance monitoring.

Building owners, facility managers, and occupants increasingly demand actionable and trustworthy information to support renovation planning, building operation, and investment decisions. The emergence of Digital Building Logbooks and digital renovation planning tools is shifting expectations from static compliance documents towards dynamic, continuously updated building information. OpenBEP4EU supports this transition by facilitating access to structured and reusable building performance data.

Financial institutions, insurers, investors, and ESCOs are becoming key actors in the renovation ecosystem. The growing deployment of green finance instruments, sustainability-linked investments, renovation

mortgages, and Energy Performance Contracting schemes increases the need for reliable energy and building performance data. OpenBEP4EU supports these stakeholders by improving data quality, transparency, and interoperability, thereby reducing information asymmetries and supporting more informed investment and risk assessment decisions.

Overall, the stakeholder value proposition of OpenBEP4EU has evolved beyond EPC interoperability alone. The project increasingly contributes to the development of a broader digital building ecosystem that supports Digital EPCs, Digital Building Logbooks, Smart Readiness Indicators, renovation planning, sustainable finance, and data-driven policymaking. Through these contributions, OpenBEP4EU supports the ongoing digital and green transformation of the European building sector and the achievement of the EU's long-term decarbonisation objectives.

3.3. Refined value proposition for OpenBEP4EU solutions

The Business Model Canvas (BMC) methodology was selected by the consortium as the basis for the development of the first version of After-LIFE Conservation Plan. Recognising that multiple value propositions can emerge both individually and through collaboration among project partners, the consortium first identified and defined the project's main value propositions. As a next step, the key market needs and challenges identified at a high level were mapped against these value propositions using the Value Proposition Canvas (VPC) methodology. This approach helped assess how the OpenBEP4EU solutions address stakeholder needs and support value creation across the building energy performance ecosystem.

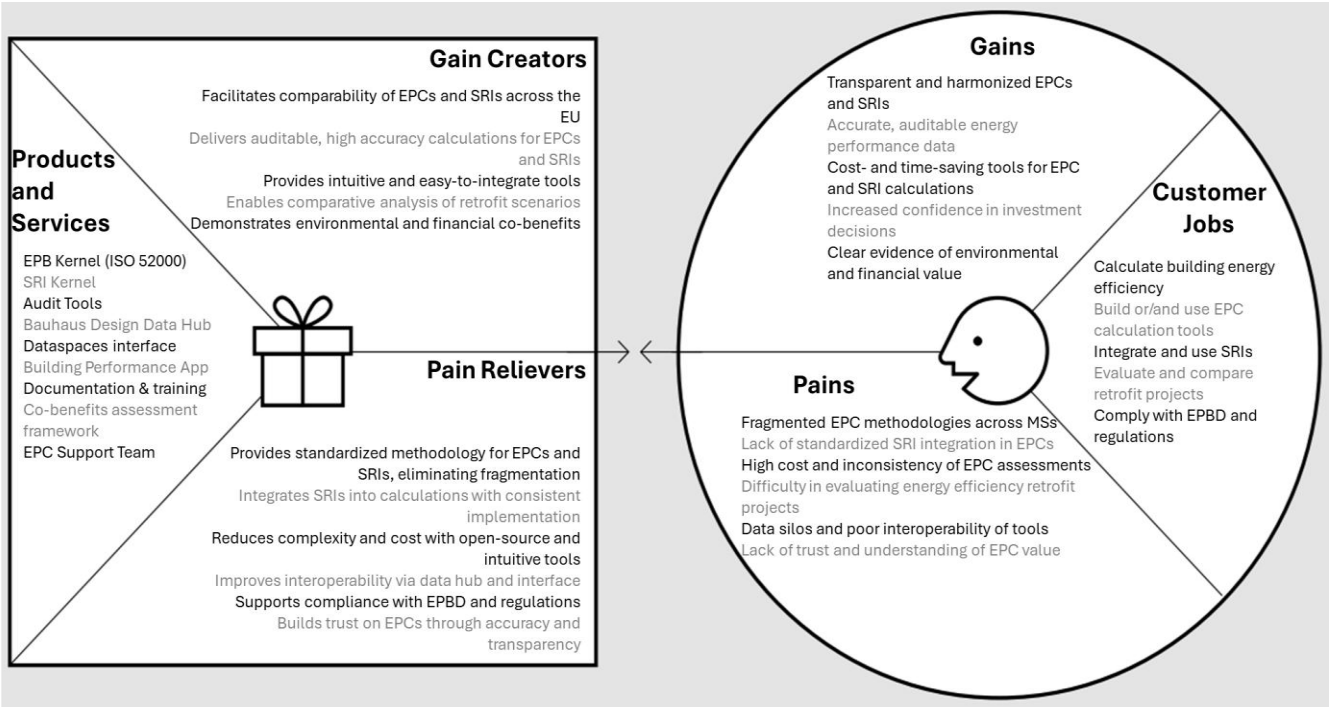

Figure 1: OpenBEP4EU Value Proposition Canvas

Customer needs

Stakeholders across the building sector increasingly require accurate, reliable, and harmonised building energy performance assessments to support regulatory compliance, benchmark building performance, and plan cost-effective renovation actions. Public authorities, EPC assessors, building owners, and financial institutions need calculation methodologies that are transparent, trustworthy, and aligned with the revised EPBD and the

EN ISO 52000 family of standards, enabling consistent and comparable results across different regions and Member States.

Stakeholders need to be enabled to develop, integrate, and use EPC calculation tools based on common methodologies. Through the project's open, modular, and interoperable Digital Toolbox, reusable calculation engines, APIs, and BIM integration capabilities can reduce market fragmentation while facilitating interoperability and comparability across Member States. By integrating EPC and SRI assessments within a single framework, the evaluation of energy efficiency, smart readiness, and building performance are supported, responding to the growing demand for smart and digital-ready buildings. Stakeholders need to be enabled to assess and compare renovation scenarios, estimate energy savings, and support investment decisions. By delivering outputs aligned with European standards and regulations, OpenBEP4EU supports data-driven renovation planning, policy implementation, and investment decision-making throughout the building lifecycle.

Gains

Significant benefits are delivered to stakeholders by providing transparent, harmonised, and interoperable EPC and Smart Readiness Indicator (SRI) assessments, improving comparability and consistency across Member States. This strengthens trust in building performance information and supports the implementation of European policies related to the EPBD, Digital EPCs, and Digital Building Logbooks. The project enables access to accurate, auditable, and standards-based building performance data, reducing uncertainty in assessments and supporting evidence-based decision-making. Public authorities, assessors, building owners, and financial institutions benefit from improved data quality, reliability, and traceability, facilitating regulatory compliance and performance monitoring. Also, gains are generated through cost and time efficiencies. Its reusable calculation engines, open APIs, BIM integration capabilities, and interoperable Digital Toolbox simplify EPC and SRI assessment processes, reduce administrative effort, minimise manual data handling, and streamline the development and deployment of digital energy performance solutions. Finally, the project supports better investment and renovation decisions by providing trustworthy and comparable performance information. Stakeholders can evaluate renovation scenarios, estimate energy savings, assess smart building capabilities, and demonstrate environmental and financial benefits. This reduces investment risks, supports green finance and Energy Performance Contracting schemes, and facilitates compliance with European sustainability and decarbonisation objectives.

Pains

Stakeholders currently face considerable challenges due to the fragmentation of EPC methodologies and assessment practices across Member States, which results in inconsistent outcomes, limited comparability, and reduced confidence in building performance assessments. These differences create difficulties for policymakers, building owners, investors, and market actors seeking to compare results, monitor progress, and support EU-wide energy efficiency objectives. Another important challenge is the limited integration of Smart Readiness Indicators (SRIs) into existing EPC frameworks. In many cases, stakeholders lack standardised approaches and tools to assess smart building capabilities, making it difficult to evaluate automation, flexibility, occupant comfort, and smart energy services in a consistent manner across Europe. Stakeholders also face high assessment costs, administrative complexity, and varying quality levels among existing EPC tools and services. Many current solutions require manual data processing, duplicate data entry, and fragmented workflows, increasing the effort required for assessments and limiting the scalability of digital EPC ecosystems.

In addition, building owners, ESCOs, public authorities, and financial institutions often experience difficulties in evaluating renovation scenarios and prioritising investments due to the lack of harmonised and interoperable tools. The existence of data silos and limited interoperability between building performance systems further restricts data sharing, integration, and the development of innovative digital services. Finally, there remains a lack of trust and understanding regarding the value of EPCs and related assessment tools. Many users continue to perceive EPCs primarily as compliance instruments rather than as strategic tools that can support

renovation planning, sustainable finance, smart building deployment, and data-driven decision-making. OpenBEP4EU aims to address these challenges by improving transparency, interoperability, harmonisation, and the overall usability of building performance information.

Products and services

A comprehensive portfolio of digital tools, services, and supporting resources designed is offered to improve the quality, interoperability, and usability of building energy performance assessments across Europe. At its core are the EPB Kernel, providing harmonised energy performance calculations aligned with the EN ISO 52000 family of standards, and the Smart Readiness Indicator (SRI) Kernel, enabling the standardised assessment of smart building capabilities and supporting the implementation of the revised EPBD. To facilitate practical deployment, OpenBEP4EU provides Audit Tools that support data collection, validation, and quality assurance processes for EPC and SRI assessments. These are complemented by the Building Performance App, which offers a user-friendly interface for energy assessors, public authorities, building owners, and other stakeholders, facilitating assessment activities, analysis, and decision-making. The project further supports interoperability and data-driven services through the Bauhaus Design Data Hub, which acts as a repository of building performance data, reference datasets, best practices, and implementation knowledge. In parallel, the dataspaces compliance enables secure, sovereign, and GDPR-compliant data exchange among stakeholders, facilitating integration with Digital Building Logbooks, national EPC ecosystems, and emerging European building data infrastructures. Beyond technical tools, OpenBEP4EU provides documentation, training materials, capacity-building activities, and expert support services to facilitate adoption and implementation. The project also delivers a co-benefits assessment framework that helps stakeholders evaluate the environmental, economic, and societal impacts of renovation measures, while the EPC Support Team provides guidance on EPC implementation, regulatory compliance, and the practical application of OpenBEP4EU solutions. Together, these products and services form an interoperable ecosystem that supports building decarbonisation, digitalisation, renovation planning, and sustainable finance initiatives.

Gain creators

Value is created by delivering harmonised and interoperable EPC and Smart Readiness Indicator (SRI) assessments, improving comparability and transparency across Member States. With common calculation methodologies aligned with the EPBD and EN ISO 52000 series of standards, the project supports greater consistency in building performance assessments and contributes to increased trust among authorities, assessors, building owners, financial institutions, and policymakers. The project further generates value by providing accurate, auditable, and standards-based calculation engines that enhance the reliability of EPC and SRI results. Improved data quality, traceability, and transparency reduce uncertainty in assessments and support evidence-based decision-making for renovation planning, policy implementation, compliance monitoring, and sustainable finance initiatives.

OpenBEP4EU also creates gains through its user-friendly and interoperable digital tools, including reusable calculation engines, APIs, BIM integration capabilities, and digital assessment applications. These components simplify complex assessment processes, reduce administrative burden, lower implementation costs, and accelerate the deployment of digital EPC ecosystems and related services. In addition, the project supports the evaluation and comparison of renovation and retrofit scenarios, enabling building owners, public authorities, ESCOs, and financial institutions to identify cost-effective interventions, estimate energy savings, and prioritise investments. The availability of harmonised and reliable building performance information increases confidence in investment and renovation decisions while facilitating access to performance-based financing mechanisms. Finally, OpenBEP4EU generates value through its co-benefits assessment capabilities, which help stakeholders quantify and communicate the environmental, economic, and societal impacts of renovation measures. By demonstrating both energy-related and broader sustainability benefits, the project supports EU climate and energy objectives, strengthens the business case for renovations, and contributes to data-driven policy and investment decisions.

Pain relievers

OpenBEP4EU addresses the challenge of fragmented EPC methodologies across Member States by providing harmonised EPC and Smart Readiness Indicator (SRI) calculation methodologies aligned with the EPBD and relevant European standards. This common framework improves consistency, comparability, and transparency in building performance assessments while supporting greater trust among stakeholders and facilitating cross-border benchmarking. The project also tackles the lack of standardised SRI integration within EPC frameworks through the provision of a unified calculation environment that incorporates both energy performance and smart readiness assessments. This enables a consistent evaluation of smart building functionalities and supports the wider adoption of SRIs as part of the European building performance ecosystem. To address the high cost, complexity, and variability of existing EPC assessment processes, OpenBEP4EU delivers open-source, interoperable, and user-friendly digital tools. Reusable calculation engines, APIs, BIM integration capabilities, and digital assessment applications help reduce administrative burden, minimise manual data processing, and lower implementation and operational costs for authorities, assessors, and software providers. The project further alleviates data silos and interoperability challenges through the Bauhaus Design Data Hub, open APIs, and data-space-compliant interfaces that facilitate secure and efficient data exchange among stakeholders. This improves integration with national EPC registries, Digital Building Logbooks, BIM environments, and other digital building platforms while promoting data-driven decision-making. In addition, OpenBEP4EU supports regulatory compliance and policy implementation by ensuring alignment with the revised EPBD, ISO 52000 standards, and emerging European digital building frameworks. Stakeholders benefit from calculation methodologies and tools designed to support Digital EPCs, Smart Readiness Indicators, renovation planning, and reporting requirements. Finally, the project helps overcome the lack of trust and understanding of EPC value by delivering accurate, transparent, and auditable building performance information. By improving the reliability and usability of EPC and SRI assessments, OpenBEP4EU supports renovation planning, sustainable finance, policy evaluation, and investment decision-making, demonstrating the broader value of building performance data beyond simple regulatory compliance.

Based on the analysis presented above, the main value propositions of OpenBEP4EU can be encapsulated in the following three value propositions:

1. Harmonised energy efficiency and SRI calculation
2. Open, interoperable and modular Digital Toolbox
3. Enhanced EPC trust and transparency

OpenBEP4EU further differentiates itself from existing market solutions through its open-source, standards-based approach and its ability to combine EPC and Smart Readiness Indicator (SRI) calculations within a harmonised framework aligned with the EPBD and the ISO 52000 family of standards. Unlike many existing EPC tools that operate as isolated solutions, OpenBEP4EU integrates BIM-enabled workflows, open APIs, the Bauhaus Design Data Hub, and secure data-sharing capabilities, creating a comprehensive and interoperable digital ecosystem. By combining harmonised calculations, Digital Building Logbook readiness, interoperability, co-benefits assessment, and support for data-driven decision-making, OpenBEP4EU provides a future-proof solution capable of supporting the digital and green transformation of the European building sector.

The traceability of these value propositions is presented in Table 2, which illustrates their relationship with the key exploitable outcomes of OpenBEP4EU identified in Table 1. This mapping demonstrates how the project's technical assets, tools, and services contribute to addressing stakeholder needs and delivering value across the building energy performance ecosystem.

Table 2: Traceability of value propositions to exploitable outcomes

Outcome	Harmonised energy efficiency and SRI calculation	Open, interoperable and modular Digital Toolbox	Enhanced EPC trust and transparency
Methodology to manage integration of multiple components for Digital Toolbox	Ensures seamless deployment of EPB and SRI kernels within national systems and 3rd-party software	Provides the framework for modularity and interoperability of the Digital Toolbox	
EPB Kernel	Core engine for harmonised energy performance calculations	Provides reusable open-source calculation component that can be integrated into national and third-party tools	Deliver auditable, standards-based calculations that build trust in EPC outputs
SRI Kernel	Adds smart readiness assessment, ensuring uniform integration	Provides modular SRI calculation component that can be integrated with EPC and other building-performance tools	Deliver auditable, standards-based calculations that build trust in EPC outputs
Bauhaus Design Data Hub		Central repository for datasets, best practices, and reference material, fostering openness and collaboration	Promotes transparency by providing access to reference data and best practices
Building Performance application and dataspaces compliance	Enable the development of 3rd-party applications that guide users towards energy saving methods	Enable secure data sharing and integration with external systems, supporting interoperability	Ensure secure, GDPR-compliant data exchange, reinforcing trust
Audit tools and methodologies	Enable accurate data collection for EPC and SRI calculations	Provide inputs that can be reused across assessment and calculation tools	Improve consistency and traceability of assessments, strengthening confidence in EPC results
EPC Support Team	Supports consistent uptake and implementation of harmonised EPC methodologies across Member States	Supports integration and use of OpenBEP4EU tools through technical guidance and capacity building	Engages stakeholders, provides technical expertise, and drives adoption to increase confidence in EPC reliability
Training programs and documentation provision	Support adoption and correct implementation of harmonised methodologies	Facilitate third-party development and integration through open APIs and clear guidance	Improve understanding of methodologies and tools, supporting correct use and confidence in EPC results

Approaches to organise efficient dissemination related to energy sector		Support uptake of the Digital Toolbox by communicating its components, use cases and integration opportunities	Ensure consistent communication and awareness across the energy sector

4. Exploitation and sustainability strategy

4.1. Exploitation pathways

The OpenBEP4EU Digital Toolbox can leverage multiple exploitation pathways to support market uptake, replication, and long-term sustainability. Over the last year, the focus within the European building sector has progressively shifted from policy design to the implementation of the revised Energy Performance of Buildings Directive (EPBD), creating favourable conditions for the adoption of interoperable digital tools EPCs, SRIs, and Digital Building Logbooks.

One primary exploitation pathway is the integration of the OpenBEP4EU solutions into national EPC and building performance assessment ecosystems. As Member States prepare the implementation of the EPBD and the development of National Building Renovation Plans, there is increasing interest in harmonised calculation approaches, interoperable data models, and digital assessment tools. The OpenBEP4EU EPB and SRI calculation engine can support these efforts by reducing implementation costs, facilitating compliance with regulatory requirements, and accelerating the deployment of digital EPCs and related services. Its modular and open architecture allows adaptation to national contexts while preserving interoperability across Europe.

A second important pathway concerns the provision of open APIs, technical services, and integration support to software developers, technology providers, ESCOs, and digital platform operators. The growing demand for interoperable building data ecosystems, Digital Building Logbooks, renovation support platforms, and advanced analytics services creates opportunities for third parties to develop value-added applications building upon the OpenBEP4EU infrastructure. These may include renovation planning services, portfolio analysis tools, smart readiness assessments, carbon and sustainability reporting solutions, and AI-enabled decision-support applications.

Additional opportunities arise through public procurement, large-scale renovation programmes, and building portfolio management initiatives led by public authorities and large asset owners. The increasing use of digital building data to support renovation planning, compliance monitoring, and sustainable finance can facilitate the deployment of OpenBEP4EU-based solutions across public building stocks, social housing portfolios, and large commercial assets.

Finally, the project's long-term sustainability can be reinforced through strategic collaboration and alignment with public authorities, ESCOs, financial institutions, technology providers, Digital Building Logbook initiatives, and emerging European data spaces. By supporting interoperability, transparency, and data-driven decision-making, OpenBEP4EU is well positioned to contribute to the digital and green transformation of the European building sector and to the implementation of the EPBD, Renovation Wave, and sustainable finance objectives.

4.2. Business and sustainability models

4.2.1. Business and sustainability overview

The Business Model Canvas (BMC) was used to structure and analyse the sustainability options of OpenBEP4EU. The resulting business model follows a hybrid approach combining open-source assets, public-sector adoption, technical and integration services, ecosystem partnerships, and value-added applications built on top of the project's digital infrastructure. This approach enables the creation, delivery, and capture of

value across the European building energy performance ecosystem while supporting the long-term sustainability and replication of the project results. The details of the business model canvas are illustrated in Figure 2.

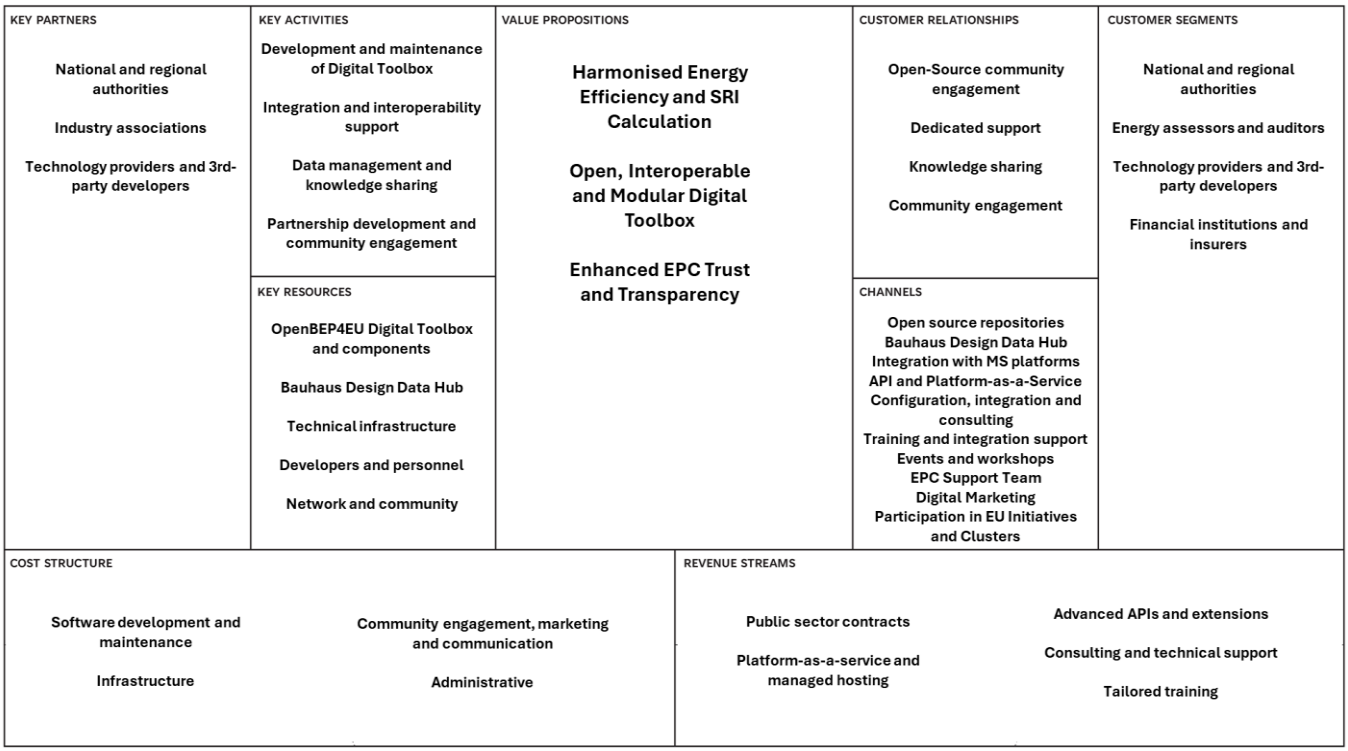

Figure 2: OpenBEP4EU Business Model Canvas

4.2.2. Consolidated value propositions

The Business Model Canvas builds upon the refined value propositions identified through the market, policy, and stakeholder analysis. These value propositions have further gained relevance during the implementation phase of the revised Energy Performance of Buildings Directive (EPBD), the deployment of Digital Building Logbooks, and the increasing demand for interoperable building data ecosystems. The consolidated value propositions are the following:

- **Harmonised Energy Efficiency and SRI Calculation**: OpenBEP4EU provides a unified, open-source calculation framework for EPC and Smart Readiness Indicators (SRI), aligned with relevant European standards and the revised EPBD. The solution promotes methodological consistency, improves comparability across Member States, reduces market fragmentation, and supports emerging regulatory requirements related to digital EPCs, building renovation planning, and smart building deployment.
- **Open, Interoperable and Modular Digital Toolbox**: OpenBEP4EU offers a flexible and extensible digital ecosystem comprising APIs, BIM integration capabilities, calculation engines, and the Bauhaus Design Data Hub. The toolbox enables interoperability between EPC systems, Digital Building Logbooks, building management platforms, and third-party applications, facilitating seamless data exchange and supporting the development of innovative digital services across the building lifecycle.
- **Enhanced EPC Trust and Transparency**: OpenBEP4EU delivers auditable, accurate, and transparent and reliable building performance information that strengthens confidence among public authorities, EPC assessors, building owners, financial institutions, and technology providers. Improved data quality and interoperability support evidence-based decision-making, renovation planning, sustainable

finance mechanisms, and compliance monitoring within the broader European digital building ecosystem.

4.2.3. Key partners

The successful exploitation and long-term sustainability of OpenBEP4EU depend on a diverse ecosystem of partners that contribute to the development, deployment, adoption, and maintenance of the project's results. As the implementation of the revised EPBD progresses across Europe, collaboration among public authorities, technology providers, market actors, and research organisations is becoming increasingly important to support interoperable and scalable building performance assessment solutions.

National and regional authorities represent key partners, as they are responsible for the implementation of EPC schemes, NBRPs, and broader EPBD requirements. Their involvement can facilitate the adoption of OpenBEP4EU methodologies, calculation engines, and interoperability frameworks within national regulatory environments.

Technology providers, software vendors, and third-party developers play a critical role in integrating OpenBEP4EU components into commercial software solutions, digital building platforms, BIM environments, and Digital Building Logbook infrastructures. Their participation can accelerate market uptake and foster innovation through value-added services built on top of the OpenBEP4EU Digital Toolbox.

ESCOs, building consultancies, and renovation service providers represent important partners in applying OpenBEP4EU solutions in renovation projects, energy performance assessments, and energy performance contracting schemes. These stakeholders can support the practical deployment and validation of project outcomes in real-world contexts.

Financial institutions, insurers, and sustainable finance actors are increasingly relevant partners due to the growing importance of performance-based financing, green loans, renovation mortgages, and ESG reporting. Reliable and interoperable building performance data generated through OpenBEP4EU can support investment decisions and risk assessment processes.

Standardisation bodies, research organisations, and European initiatives contribute to the alignment of OpenBEP4EU with emerging standards, policy developments, and interoperability frameworks. Collaboration with Digital Building Logbook initiatives, SRI activities, and European data space initiatives further strengthens the project's positioning within the evolving digital building ecosystem.

Through these partnerships, OpenBEP4EU aims to support the widespread adoption of interoperable building performance assessment solutions while ensuring the long-term sustainability, replication, and impact of the project's results beyond its completion.

4.2.4. Key activities

The long-term sustainability of OpenBEP4EU relies on the continued **development, maintenance, and enhancement of the OpenBEP4EU Digital Toolbox**, including the EPC and SRI calculation engines. These activities ensure that the project outcomes remain aligned with evolving regulatory requirements, technical standards, and market needs, while supporting the ongoing implementation of the revised EPBD across Europe.

A second core activity concerns **integration, interoperability, and data governance**. This includes the development and maintenance of APIs, support for interoperability between national EPC ecosystems and Digital Building Logbooks, and the harmonisation of data models and semantic structures. These efforts facilitate

seamless data exchange and contribute to the creation of a coherent and interoperable European building data ecosystem.

OpenBEP4EU also places significant emphasis on **capacity building, technical support, and community engagement**. Training activities, technical guidance, knowledge-sharing initiatives, and user support are essential to promote adoption among public authorities, energy assessors, technology providers, and other stakeholders. At the same time, active community engagement helps strengthen collaboration, gather feedback, and encourage wider uptake of the project's solutions.

Finally, the project's sustainability strategy includes **participation in standardisation, policy, exploitation, and replication activities.** Continued engagement with European initiatives, industry stakeholders, and policy developments will support the alignment of OpenBEP4EU with emerging frameworks and market requirements. These activities will facilitate the exploitation of project results, foster ecosystem development, and create opportunities for follow-up projects, large-scale deployment, and replication across Member States.

4.2.5. Key resources

The successful exploitation and long-term sustainability depend on a set of strategic technical, organisational, and knowledge-based resources. At the core of the initiative lies the **OpenBEP4EU Digital Toolbox**, including the EPC and SRI calculation engines, APIs, interoperability components, and supporting software modules. These assets constitute the technological foundation enabling harmonised building energy performance assessments and the integration of building-related data across different platforms and stakeholders.

A second critical resource is the **Bauhaus Design Data Hub** and the associated digital infrastructure supporting data exchange, storage, interoperability, and future integration with Digital Building Logbooks, national EPC ecosystems, and emerging European data spaces. Together, these resources facilitate the management of structured building data and enable the deployment of scalable, interoperable digital services.

The project also relies heavily on its **human capital and expertise**. The consortium brings together specialised knowledge in energy performance assessment, Smart Readiness Indicators, BIM, interoperability, software development, data governance, policy implementation, and stakeholder engagement. This multidisciplinary expertise represents a valuable asset for maintaining, extending, and adapting the project outcomes to future market and regulatory developments.

Finally, an established **network of stakeholders, communities, and partnerships** built throughout the project's lifetime are beneficial. Relationships with public authorities, technology providers, certification bodies, ESCOs, financial institutions, research organisations, and standardisation initiatives provide access to valuable knowledge, feedback, dissemination channels, and future collaboration opportunities. These resources are essential for ensuring the continued adoption, replication, and scaling of OpenBEP4EU solutions beyond the project duration.

4.2.6. Customer relationships

Strong and collaborative relationships with the different stakeholder groups involved in the building energy performance ecosystem are fundamental. Given the open and interoperable nature of the project's outputs, fostering trust, transparency, and continuous engagement is essential for encouraging uptake, collecting feedback, and supporting the long-term evolution of the OpenBEP4EU Digital Toolbox.

A key element of the customer relationship strategy is the promotion of an open-source and knowledge-sharing culture. Through publicly available repositories, technical documentation, guidelines, and learning materials, OpenBEP4EU facilitates access to its solutions and encourages collaboration among developers, technology

providers, researchers, and public authorities. This approach supports transparency and helps build a sustainable community around the project's outcomes.

The project also relies on the provision of **technical support and capacity-building activities**. Training sessions, workshops, webinars, and technical guidance materials help stakeholders understand, adopt, and integrate OpenBEP4EU solutions into their existing processes and systems. Such activities are particularly important for public authorities, EPC assessors, software vendors, and other organisations involved in the implementation of digital EPCs, Smart Readiness Indicators, and Digital Building Logbooks.

Finally, OpenBEP4EU seeks to establish long-term relationships through **community engagement, stakeholder collaboration, and participation in broader European initiatives and ecosystems**. Continuous interaction with policymakers, industry associations, ESCOs, financial institutions, standardisation bodies, and technology providers, enables the project to remain aligned with emerging market needs and regulatory developments while fostering future collaboration, replication, and scaling opportunities.

4.2.7. Customer segments

OpenBEP4EU addresses a diverse set of stakeholders involved in the assessment, management, financing, and digitalisation of building energy performance. The project's solutions have been designed to support both public and private sector actors that require reliable, interoperable, and standardised building performance information for compliance, operational, and decision-making purposes.

National and regional authorities, together with public building agencies, constitute one of the primary target groups. These organisations are responsible for implementing Energy Performance Certificate (EPC) schemes, National Building Renovation Plans, and broader Energy Performance of Buildings Directive (EPBD) requirements. OpenBEP4EU can support these stakeholders through harmonised calculation methodologies, interoperable digital tools, and improved data management capabilities.

Building performance professionals, certification bodies, software vendors, and technology providers represent another key customer segment. These actors can benefit from the project's digital toolbox, APIs, interoperability mechanisms, and calculation engines to streamline assessment processes, improve data quality, and develop innovative services supporting digital EPCs, SRIs, and Digital Building Logbooks.

ESCOs, building owners, facility managers, and renovation service providers can utilise OpenBEP4EU solutions to support renovation planning, performance monitoring, benchmarking, and energy efficiency investments. Access to transparent and standardised building performance data can facilitate decision-making and improve the effectiveness of renovation projects and energy performance contracting schemes.

Finally, **financial institutions, insurers, research organisations, and standardisation bodies** can benefit from the improved accessibility, reliability, and interoperability of building performance data. Such information can support green finance mechanisms, risk assessment, policy evaluation, innovation activities, and the development of future standards and regulatory frameworks within the European digital building ecosystem.

4.2.8. Channels and sustainability mechanisms

OpenBEP4EU leverages multiple channels to facilitate market uptake, stakeholder engagement, and the long-term sustainability of its results. A primary channel is the integration of the project's solutions into **national EPC ecosystems**, where authorities and certification bodies can adopt harmonised EPC and SRI calculation methodologies and digital assessment tools. This pathway can support the implementation of the revised EPBD while reducing development and operational costs for national schemes.

The project's **open APIs, repositories, and interoperability services** provide additional channels for technology providers, software vendors, and third-party developers to integrate OpenBEP4EU components into existing digital platforms and building management solutions. These channels enable the development of value-added services or offerings, including building performance analytics, renovation planning applications, digital building logbook integrations, and smart building management solutions.

Knowledge transfer, capacity building, and stakeholder engagement constitute essential channels for supporting the adoption and long-term sustainability of OpenBEP4EU solutions. Through these activities, the project fosters awareness, facilitates knowledge exchange, and supports the effective implementation of digital EPCs, SRIs, and interoperable building data solutions.

- **Events and workshops**
  Organisation and participation in conferences, webinars, workshops, and stakeholder events to disseminate project results, exchange best practices, gather feedback, and strengthen collaboration across the building energy performance ecosystem.
- **EPC Support Team**
  A dedicated OpenBEP4EU support team can promote the adoption of project solutions, provide guidance on EPBD implementation, and support public authorities, building performance professionals, software providers, and other stakeholders in using the project's tools and methodologies.
- **Digital marketing**
  Targeted communication and dissemination activities through websites, newsletters, social media platforms, online communities, and specialised energy-related communication channels to increase visibility and encourage adoption of OpenBEP4EU results.
- **Participation in EU Initiatives and Clusters**
  Active involvement in European initiatives, clusters, working groups, and follow-up projects aligned with OpenBEP4EU objectives. Such participation strengthens networking opportunities, supports standardisation and interoperability efforts, and facilitates the replication and scaling of project outcomes across Europe.

The sustainability of the project outcomes is further supported through a combination of public-sector adoption, ecosystem partnerships, technical support services, follow-up research and innovation projects, and community-driven collaboration. Together, these channels and mechanisms contribute to maintaining and expanding the OpenBEP4EU ecosystem beyond the project's lifetime.

4.2.9. Revenue streams and sustainability mechanisms

As an EU-funded initiative, OpenBEP4EU is not intended to operate as a standalone commercial entity. Nevertheless, several revenue-generating and sustainability mechanisms can support the long-term maintenance and evolution of the project's outcomes. The project's open and modular architecture enables different exploitation approaches that can be adopted individually by consortium partners or through future collaborative initiatives.

One important sustainability pathway is the adoption of OpenBEP4EU components by national and regional authorities responsible for implementing EPC schemes and related EPBD requirements. The project's harmonised calculation engines, interoperability frameworks, and digital tools may reduce development costs and accelerate the deployment of digital EPC ecosystems, creating opportunities for technical support, customisation, maintenance, and integration services.

A further mechanism relates to the provision of technical consultancy, integration services, API-based solutions, and Platform-as-a-Service (PaaS) offerings. Technology providers, software vendors, ESCOs, and digital building logbook operators may require support for integrating OpenBEP4EU functionalities into their existing platforms and services. In addition to customisation projects, interoperability support, and technical assistance, organisations may benefit from hosted API and PaaS solutions, enabling them to access OpenBEP4EU capabilities without the need to deploy and maintain the underlying infrastructure. This creates opportunities for managed services and the development of value-added applications based on the OpenBEP4EU Digital Toolbox.

The increasing implementation of digital building logbooks, SRIs, and National Building Renovation Plans also creates opportunities for training, capacity-building, and knowledge-transfer services. Public authorities, assessors, software developers, and building professionals may require guidance, training materials, and technical support to effectively adopt and use the project's methodologies and tools.

In parallel, participation in follow-up European projects and innovation initiatives can provide additional resources for maintaining and extending the project's outcomes. OpenBEP4EU establishes a strong foundation for future collaboration in areas such as digital EPCs, building data interoperability, sustainable finance, building renovation planning, and smart building services. Such initiatives can support both the continuous improvement of the technical assets and their wider deployment across Europe.

Finally, the long-term sustainability can be strengthened through partnerships with public authorities, ESCOs, financial institutions, technology providers, Digital Building Logbook initiatives, and European data space projects. These collaborations can facilitate large-scale deployment, ecosystem growth, knowledge exchange, and market uptake, ensuring that the project's results continue to generate value beyond its funded lifetime.

4.2.10. Cost structure and operational requirements

The long-term sustainability requires the allocation of adequate technical, organisational, and financial resources to ensure the continued operation, maintenance, and evolution of the project's outcomes. Although the project promotes the adoption of open and interoperable solutions, sustaining the OpenBEP4EU ecosystem beyond the project lifetime requires ongoing investment in technical infrastructure, software maintenance, stakeholder engagement, and governance activities.

A significant portion of the operational costs is associated with the maintenance and enhancement of the OpenBEP4EU Digital Toolbox, including the EPC and Smart Readiness Indicator (SRI) calculation engines, APIs, interoperability services, and supporting software components. Continuous updates may be required to accommodate evolving standards, regulatory requirements, technological developments, and user needs. Additional resources are needed for quality assurance, testing, cybersecurity measures, and technical documentation.

The operation of supporting digital infrastructure, including repositories, data exchange mechanisms, and the Bauhaus Design Data Hub, also generates costs related to hosting services, cloud resources, storage, security, and system administration. As interoperability becomes increasingly important within the European building data ecosystem, resources may additionally be required for semantic harmonisation, data governance activities, and integration with external platforms such as Digital Building Logbooks, national EPC registries, and emerging European data spaces.

Beyond technical aspects, OpenBEP4EU requires resources for capacity building, dissemination, community management, and stakeholder support. Training activities, workshops, webinars, communication materials, technical assistance services, and participation in relevant European initiatives and standardisation activities are important for maintaining stakeholder engagement and promoting sustained adoption of project outcomes.

Coordination and governance activities may also be required to manage future collaborations, partnerships, and follow-up initiatives.

To address these operational requirements, OpenBEP4EU may rely on a combination of public-sector adoption, ecosystem partnerships, consultancy and technical support services, follow-up European projects, training activities, and other sustainability mechanisms identified in the previous section. Together, these measures can contribute to maintaining the project's assets and maximising their long-term impact within the European building energy performance ecosystem.

4.2.11. Sustainability assessment

A SWOT analysis was conducted to evaluate the long-term sustainability and exploitation potential of OpenBEP4EU, taking into account both internal project characteristics and external market, policy, and technological developments shaping the European building sector.

Strengths

OpenBEP4EU benefits from strong alignment with the revised EPBD, the Renovation Wave, and relevant European standards, including EN ISO 52000 family of standards, supporting regulatory acceptance and future adoption across Member States. Its open-source framework promotes transparency, adaptability, and cost-effectiveness, enabling public authorities and market actors to customise and extend the project's solutions while reducing vendor lock-in. A key asset is the interoperable Digital Toolbox, which integrates EPC and SRI calculation engines, BIM capabilities, APIs, and the Bauhaus Design Data Hub within a unified ecosystem that supports seamless data exchange and integration. Finally, the project's modular and future-proof architecture facilitates integration with Digital Building Logbooks, renovation passports, digital twins, and other emerging EU digital building initiatives, ensuring long-term scalability and relevance.

Weaknesses

Despite its strong technical foundation, OpenBEP4EU digital tools may require further development, validation, and real-world testing before large-scale deployment across different national contexts. The project's long-term sustainability also depends on securing resources beyond the project lifetime, as financial sustainability remains partially reliant on public funding and follow-up initiatives. Continued maintenance, technical support, and platform evolution will require sustainable operational and funding mechanisms. Another challenge concerns the coordination and engagement of diverse stakeholder groups, including public authorities, EPC assessors, software developers, technology providers, and building professionals. The successful adoption of OpenBEP4EU solutions requires tailored communication, capacity-building activities, and support adapted to the specific needs of each audience. Market awareness and acceptance remain limited in some segments, where EPCs and SRIs are still often perceived as regulatory compliance instruments rather than strategic tools supporting renovation planning, building optimisation, sustainable finance, and data-driven decision-making. Increasing awareness of their broader value proposition will be important for accelerating market uptake.

Opportunities

The evolving European policy and market landscape creates significant opportunities for OpenBEP4EU. The implementation of the European Green Deal, the Renovation Wave, and the revised EPBD is generating strong demand for harmonised EPCs, SRIs, Digital Building Logbooks, and interoperable building data infrastructures. The progressive rollout of mandatory digital EPCs across Member States creates a substantial market pull for standardised and interoperable calculation engines, data models, and digital assessment tools. OpenBEP4EU is well positioned to support these requirements through its harmonised methodologies, open-source architecture, and interoperability capabilities. Additional opportunities arise from the increasing adoption of BIM, digital twins, and data-driven building management solutions. Growing demand for automated and BIM-integrated

energy assessment tools creates favourable conditions for the deployment of OpenBEP4EU components and services throughout the building lifecycle, from design and renovation planning to operation and performance monitoring. Furthermore, the growing uptake of smart building technologies and SRIs is increasing interest in occupant-centric and data-driven solutions that improve energy efficiency, comfort, flexibility, and building performance. At the same time, the expansion of green finance, sustainable investment schemes, and Energy Performance Contracting is creating demand for reliable EPC and SRI data that can support risk assessment, performance-based financing, ESG reporting, and investment decision-making. OpenBEP4EU can contribute to these developments by providing trusted, interoperable, and transparent building performance information.

Threats

Several external factors may affect the long-term adoption and sustainability of OpenBEP4EU. One important challenge is the potential resistance to harmonisation at national level, as some Member States may prefer to maintain existing EPC methodologies, software solutions, and administrative procedures. Such differences could slow the adoption of harmonised calculation frameworks and interoperable approaches promoted by the project. Another threat relates to the complexity of integrating OpenBEP4EU components with diverse national EPC registries, Digital Building Logbooks, legacy systems, and existing software infrastructures. Variations in data formats, technical architectures, and national regulatory requirements may increase implementation costs and deployment times. The project must also address data protection, cybersecurity, and GDPR compliance requirements, which are becoming increasingly important as building performance data is digitised and exchanged across multiple platforms. Ensuring data sovereignty, security, transparency, and regulatory compliance may require additional technical, organisational, and governance measures that could affect deployment timelines. Finally, OpenBEP4EU operates within a competitive market where established EPC software providers and digital building solution vendors already possess significant market penetration and customer bases. These organisations may accelerate innovation, develop competing interoperability solutions, or reduce costs to preserve market share. To remain competitive, OpenBEP4EU will need to continue demonstrating its added value through openness, interoperability, regulatory alignment, and support for emerging European digital building ecosystems.

Leveraging Strengths and Opportunities

OpenBEP4EU is well positioned to capitalise on the growing implementation of the revised EPBD, the deployment of Digital EPCs, SRIs, and Digital Building Logbooks, as well as the broader objectives of the European Green Deal and Renovation Wave. Its alignment with EU policy objectives, open-source architecture, and harmonised calculation methodologies provide a strong foundation for becoming a reference solution for interoperable building energy performance assessment across Europe. The project's modular design, BIM integration capabilities, and support for digital building ecosystems further strengthen its potential to address emerging needs related to digital twins, renovation planning, performance monitoring, and sustainable finance. In addition, the ability to deliver reliable and transparent EPC and SRI data creates opportunities for collaboration with public authorities, ESCOs, financial institutions, and technology providers seeking trusted information to support investment decisions, renovation programmes, and green financing mechanisms.

Mitigating Weaknesses and Threats

To maximise its long-term impact, OpenBEP4EU should continue demonstrating its value through pilot deployments, real-world validation activities, and collaboration with key market actors. A clear sustainability roadmap supported by strategic partnerships, EPC support team, technical support services, and participation in follow-up European initiatives can help reduce dependence on project-based funding and strengthen long-term viability. Potential barriers related to national adaptation requirements and system integration can be addressed through robust APIs, modular deployment options, comprehensive technical documentation, and targeted training activities. Furthermore, maintaining strong data governance practices, ensuring GDPR compliance, and implementing secure data-sharing mechanisms will be essential to preserving stakeholder trust and

facilitating adoption. By combining these actions with continuous stakeholder engagement and ecosystem development, OpenBEP4EU can effectively mitigate risks while strengthening its role within the emerging European digital building ecosystem.

4.3. Business model implementation

To facilitate a better understanding of how the building model above is implemented and how the elements of the different building blocks of the Business Model Canvas are connected, indicative business cases implementing business model are given in this section.

4.3.1. Implementation case 1: Harmonised EPC and SRI calculation services

Scenario: A national authority integrates the OpenBEP4EU Digital Toolbox into its existing EPC ecosystem to support the implementation of the revised EPBD, Digital EPCs, and Smart Readiness Indicators (SRIs), while improving interoperability and consistency across regions.

Value delivered: OpenBEP4EU provides a harmonised and standards-based calculation framework for EPCs and SRIs, supporting regulatory compliance, methodological consistency, and improved comparability of building performance assessments. By relying on common calculation methodologies and interoperable digital components, authorities can enhance the quality, transparency, and credibility of EPC and SRI assessments while facilitating monitoring, reporting, and policy evaluation activities. As Member States progress with the implementation of the revised EPBD and the deployment of digital EPC ecosystems, there is an increasing need for reliable and harmonised assessment methodologies. In this implementation case, the OpenBEP4EU Digital Toolbox serves as a common calculation backbone that can be integrated into national EPC platforms, Digital Building Logbook initiatives, and related building performance assessment systems. The solution supports automated calculations, reduces administrative effort, improves data consistency, and facilitates the exchange of building performance information across different stakeholders and systems.

The adoption of OpenBEP4EU enables authorities to benefit from a modular and open architecture that can be adapted to national requirements while maintaining interoperability with European standards and frameworks. This flexibility allows Member States to preserve specific national characteristics where needed, while simultaneously contributing to a more coherent European building performance ecosystem. The integration of EPC and SRI assessment functionalities further supports renovation planning, smart building deployment, and evidence-based policymaking. The implementation model combines the availability of open-source software components with value-added support services. Core calculation engines, APIs, technical documentation, and interoperability modules can be accessed through open repositories, encouraging transparency and facilitating adoption. To support deployment, consortium partners and ecosystem actors may provide integration assistance, technical consultancy, customisation services, training activities, and Platform-as-a-Service (PaaS) offerings for organisations seeking managed solutions. These complementary services can contribute to the long-term sustainability of the ecosystem while preserving the open and collaborative nature of the project.

Strategic partnerships with national authorities, EPC agencies, industry associations, standardisation bodies, and Digital Building Logbook initiatives can further strengthen adoption and facilitate regulatory alignment. In parallel, the Bauhaus Design Data Hub and other knowledge-sharing mechanisms can support the dissemination of best practices, technical guidance, and implementation experiences. Through this approach, OpenBEP4EU can contribute to the large-scale deployment of harmonised EPC and SRI assessment services while supporting the digital and green transformation of the European building sector.

4.3.2. Implementation case 2: Delivery of energy efficiency software solutions

Scenario: A technology provider or software vendor develops an advanced energy efficiency software suite by integrating components of the OpenBEP4EU Digital Toolbox. The solution leverages harmonised EPC and SRI calculation engines, BIM integration capabilities, and open APIs to deliver digital services supporting building energy performance assessments, renovation planning, compliance reporting, and building performance analysis.

Value delivered: An open, modular, and interoperable digital toolbox that accelerates the development of innovative energy performance software solutions while ensuring compatibility with European standards and EPBD requirements. The approach reduces development effort, shortens time-to-market, and enables software providers to focus on value-added services rather than core compliance functionalities.

A technology provider integrates the OpenBEP4EU EPC and SRI calculation engines, APIs, BIM connectors, and interoperability modules into its software environment. During the initial stages, the provider may utilise hosted API or PaaS offerings to accelerate development and reduce infrastructure requirements. As the solution matures and adoption increases, deployment can gradually transition to dedicated infrastructure while preserving interoperability with the OpenBEP4EU ecosystem. This approach allows software vendors to concentrate on developing advanced services such as building performance analytics, dashboards, renovation planning, Digital Building Logbook integration, smart building functionalities, and decision-support tools, while OpenBEP4EU provides the underlying calculation, interoperability, and compliance framework. The result is a competitive and future-proof solution capable of addressing the growing demand for digital energy efficiency applications and smart building services.

In this context, OpenBEP4EU acts as an innovation enabler, providing a reusable and interoperable technology foundation that can be incorporated into third-party software products. The availability of open-source components, documented APIs, technical guidance, and reference implementations reduces barriers to entry for developers and encourages wider market uptake. Additional sustainability mechanisms may include managed API and PaaS services, technical consultancy, customisation and integration support, training activities, and participation in follow-up European initiatives. Furthermore, the Bauhaus Design Data Hub provides datasets, reference materials, and best practices that support software development and accelerate innovation across the building energy performance ecosystem. Through this combination of openness and value-added services, OpenBEP4EU promotes interoperability, innovation, and long-term sustainability within the European digital building market.

4.3.3. Implementation case 3: Enhanced trust and transparency in building energy performance data

Scenario: A financial institution introduces green mortgages, renovation loans, or sustainability-linked financing products that rely on verifiable EPC and SRI data generated through interoperable and standardised assessment methodologies. Loan eligibility, financing conditions, and risk assessments are partially linked to measurable improvements in building energy performance and smart readiness.

Value delivered: Trustworthy, transparent, and auditable building performance data reduces information asymmetries and financial risks, supports performance-based financing mechanisms, and facilitates alignment with European climate, energy, and sustainable finance policies. Reliable EPC and SRI information enables more informed investment decisions and contributes to the development of innovative green finance products.

A financial institution introduces green mortgages, renovation loans, or sustainability-linked financing products supported by verifiable EPC and SRI outcomes. By leveraging the open, standardised, and auditable building performance data enabled by OpenBEP4EU, the institution can improve risk assessment processes, reduce information asymmetries, and support compliance with evolving EU and national regulatory frameworks. This enables performance-based financing schemes where loan conditions are linked to measurable energy performance improvements and facilitates the development of renovation-oriented financial products. Furthermore, the Bauhaus Design Data Hub can support knowledge exchange, anonymised benchmarking, and best-practice sharing, while data-space-compliant interfaces enable secure and GDPR-compliant data exchange among relevant stakeholders.

For financial institutions, OpenBEP4EU provides enhanced trust, transparency, and data quality through harmonised methodologies, auditability, interoperability, and regulatory alignment. The business model combines open access to calculation methodologies and digital building performance data with value-added services such as customised APIs for portfolio analysis, integration support for risk assessment and ESG workflows, technical consultancy, and targeted training for finance professionals. These capabilities enable the incorporation of reliable building performance information into investment decisions, renovation financing schemes, portfolio management processes, and sustainability reporting activities. The model creates a direct link between building energy performance assessment and green finance opportunities, supporting the development of performance-based financial instruments and renovation investment strategies. At the same time, it generates sustainability opportunities through value-added services, technical support, interoperability solutions, and ecosystem partnerships, positioning OpenBEP4EU as a trusted enabler of data-driven sustainable finance and building renovation across Europe.

5. Stakeholder and market engagement

5.1. Stakeholder adoption potential

OpenBEP4EU addresses the needs of a broad range of stakeholders involved in building energy performance assessment, renovation planning, digitalisation, and sustainable finance. The implementation of the revised EPBD, the rollout of Digital EPCs, SRIs, and Digital Building Logbooks are creating increasing demand for harmonised methodologies, interoperable digital tools, and trustworthy building performance data.

National, regional, and local authorities represent key adopters of OpenBEP4EU solutions, as they are responsible for implementing EPC frameworks, National Building Renovation Plans, and related EPBD obligations. The project's harmonised calculation methodologies and interoperable digital infrastructure can support regulatory compliance, monitoring activities, and the development of digital building ecosystems.

Technology providers, software vendors, and third-party developers can leverage the OpenBEP4EU Digital Toolbox, APIs, BIM integration capabilities, and interoperability services to develop innovative digital building applications and value-added services. The project's open-source architecture lowers barriers to adoption while encouraging innovation and ecosystem growth.

Building owners, facility managers, building performance professionals, ESCOs, financial institutions, and investors can benefit from improved access to reliable, auditable, and interoperable building performance information. This supports more informed renovation planning, energy performance contracting, risk assessment, portfolio management, and sustainable finance activities.

5.2. Engagement of actors

Public authorities and EPC ecosystem actors have been central stakeholders throughout the OpenBEP4EU project. Engagement activities have focused on raising awareness of harmonised EPC and SRI methodologies, promoting interoperability, and supporting understanding of the opportunities created by Digital EPCs, Digital Building Logbooks, and emerging building data ecosystems.

Interactions with national authorities, energy agencies, and policymakers have highlighted the growing need for digital EPC ecosystems, harmonised calculation approaches, and interoperable data infrastructures capable of supporting Digital Building Logbooks, reporting obligations, and evidence-based policymaking. OpenBEP4EU responds to these needs by providing standards-based calculation engines, reusable digital components, and secure data-sharing capabilities. The feedback received has confirmed the relevance of OpenBEP4EU in supporting the transition towards digital, interoperable, and transparent building performance assessment systems across Europe.

OpenBEP4EU has also engaged with technology providers, software vendors, ESCOs, financial institutions, and other market actors that can play a critical role in the long-term exploitation and sustainability of project outcomes. Technology providers, software vendors, ESCOs, and financial institutions represent important market actors for the future deployment and sustainability of OpenBEP4EU results. Software vendors and technology providers can leverage the OpenBEP4EU Digital Toolbox, APIs, BIM integration capabilities, and interoperability services to accelerate the development of energy performance software solutions, Digital Building Logbooks, and advanced analytics services. The project's open-source architecture reduces development effort and encourages innovation while facilitating compliance with European standards.

ESCOs and renovation service providers recognise the value of harmonised building performance assessments for renovation planning, performance verification, and Energy Performance Contracting schemes. Financial institutions and investors increasingly require reliable and transparent building performance information to support green loans, sustainability-linked investments, renovation mortgages, and ESG-related reporting obligations. OpenBEP4EU contributes to these needs by providing auditable and interoperable EPC and SRI data that can strengthen confidence in building renovation investments and support performance-based financing approaches.

5.3. Feedback and lessons learnt

Stakeholder engagement and pilot demonstration activities generate valuable insights regarding usability, interoperability, deployment requirements, and stakeholder expectations. These interactions confirm the relevance of OpenBEP4EU's value propositions and the importance of harmonised calculation methodologies, interoperable digital infrastructures, and trustworthy building performance information.

The feedback collected contributed to the refinement and validation of Digital Toolbox components, the improvement of interoperability mechanisms, and the adjustment of exploitation and market uptake strategies. It also supported the definition of value-added service offerings, including technical support, managed hosting solutions, API-based services, and tailored training programmes.

The lessons learned have been used to refine the OpenBEP4EU Digital Toolbox, strengthen the exploitation strategy, prioritise value-added services, and enhance business and sustainability models. They have also informed the governance arrangements and market uptake actions proposed in this After-LIFE Conservation Plan.

6. After-LIFE governance

This chapter defines the governance, coordination, and operational arrangements that can support the long-term sustainability and uptake of OpenBEP4EU results beyond project completion. The proposed framework builds on the partnerships, technical assets, stakeholder networks, and knowledge developed throughout the project and aims to ensure the continued availability, maintenance, and evolution of the OpenBEP4EU ecosystem. Special emphasis is placed on preserving interoperability, supporting future adoption of the project's solutions, and facilitating collaboration among the stakeholders involved in building energy performance assessment across Europe.

6.1. Governance structure after project completion

The long-term sustainability of OpenBEP4EU relies on a collaborative governance model involving project partners, future adopters, technology providers, public authorities, and other ecosystem stakeholders. The proposed governance approach focuses on maintaining cooperation among interested organisations and facilitating the continued development, deployment, and promotion of the project's outcomes.

The governance structure aims to support the maintenance of key project assets, including the OpenBEP4EU Digital Toolbox, EPB and SRI Kernels, APIs, interoperability components, the Bauhaus Design Data Hub, and associated documentation and training resources. Partners and future contributors may participate according to their expertise, business interests, and available resources, while maintaining the open and collaborative nature of the project.

Increased attention will be given to the coordination of future developments, the identification of funding and collaboration opportunities, and the alignment of OpenBEP4EU activities with evolving European policies, standards, and initiatives. Continued engagement with Member States, EPC ecosystem actors, Digital Building Logbook initiatives, standardisation activities, and European projects will support the relevance and sustainability of the project's outcomes.

The governance model also encourages the participation of external contributors, software developers, researchers, and market actors interested in extending or integrating OpenBEP4EU functionalities. This collaborative approach can facilitate innovation, increase adoption, and strengthen the project's long-term impact across the European building sector.

6.2. Data governance and interoperability management

Data governance and interoperability constitute fundamental components of the OpenBEP4EU sustainability strategy. The project promotes secure, transparent, and standards-based management of building performance information while supporting interoperability between EPC systems, Smart Readiness Indicator frameworks, Digital Building Logbooks, BIM environments, and other digital building platforms.

Following project completion, the OpenBEP4EU ecosystem should continue to support common data models, standardised interfaces, and interoperable services that facilitate the exchange of building performance information among different stakeholders and systems. Maintaining alignment with European standards, EPBD requirements, and emerging digital building initiatives will be essential for preserving compatibility and supporting future integration activities.

The Bauhaus Design Data Hub and associated data-sharing mechanisms provide the basis for knowledge exchange, benchmarking, and the dissemination of best practices. In parallel, dataspaces compliance interfaces can support secure, controlled, and GDPR-compliant data exchange, enabling trusted collaboration

among public authorities, technology providers, building owners, financial institutions, and other actors participating in the digital building ecosystem.

Future interoperability management activities may include maintaining APIs and technical documentation, updating semantic models, supporting integration with Digital Building Logbooks and national EPC infrastructures, monitoring compatibility with evolving standards, and facilitating collaboration with emerging European data space initiatives. These actions will help ensure that OpenBEP4EU remains a relevant and interoperable component of the broader European building data ecosystem.

Overall, the proposed governance framework provides a foundation for the continued operation, maintenance, and evolution of OpenBEP4EU beyond the project lifetime, supporting the widespread adoption of harmonised EPC and SRI methodologies and contributing to the digital and green transformation of the European building sector.

7. After-LIFE roadmap

This chapter outlines the actions and priorities that will support the long-term sustainability, adoption, and scaling of OpenBEP4EU outcomes beyond the end of project funding. Building upon the project's technical achievements, stakeholder engagement activities, pilot demonstrations, and business model analysis, the roadmap identifies practical actions that can facilitate market uptake, strengthen the OpenBEP4EU ecosystem, and support the implementation of digital and interoperable building performance assessment solutions across Europe.

7.1. Key priorities for the after-LIFE phase

The after-LIFE phase will focus on maintaining and promoting the core OpenBEP4EU exploitable outcomes, including the OpenBEP4EU Digital Toolbox, the EPB and SRI Kernels, the Bauhaus Design Data Hub, the Building Performance App and interfaces, Audit Tools, and the associated documentation, training materials, and support services. These assets have the potential to contribute to the implementation of the revised EPBD, Digital EPCs, SRIs, and Digital Building Logbooks, all of which are becoming increasingly important within the European building sector [6].

A second priority concerns the continued strengthening of stakeholder relationships and ecosystem development. Particular attention will be given to collaboration with public authorities, EPC ecosystem actors, technology providers, software vendors, ESCOs, financial institutions, researchers, and standardisation activities. Such collaboration can facilitate adoption of the project's methodologies and support the deployment of interoperable building performance solutions at national and European levels [7].

Finally, the After-LIFE phase will focus on ensuring the sustainability of the project's technical assets and governance arrangements. This includes maintaining interoperability, supporting the open-source community, updating technical documentation, and pursuing opportunities for follow-up projects and strategic collaborations that can further extend the impact of OpenBEP4EU outcomes [5].

7.2. Short-, medium- and long-term actions following project completion

A phased implementation approach is proposed to support the adoption, replication, and long-term sustainability of OpenBEP4EU results.

Short-Term Actions

The immediate priority is to continue validating and demonstrating the benefits of OpenBEP4EU solutions through pilot deployments, reference implementations, and stakeholder engagement activities. These activities will help showcase the practical value of harmonised EPC and SRI methodologies while collecting additional feedback from users and adopters.

Engagement with national authorities, energy agencies, and certification bodies will continue to promote the integration of OpenBEP4EU components into national EPC frameworks and Digital Building Logbook initiatives. Capacity-building activities, training sessions, webinars, and technical workshops will further support awareness and adoption among target stakeholder groups [10].

Medium-Term Actions

In the medium term, the focus will shift towards ecosystem expansion, partnerships, and service development. Collaboration with technology providers, software vendors, ESCOs, and financial institutions can facilitate the deployment of new digital services and innovative business models built on OpenBEP4EU outcomes.

Additional efforts will concentrate on the development and provision of value-added services such as technical consultancy, API-based services, managed hosting solutions, integration support, and specialised training programmes. The Bauhaus Design Data Hub can further support knowledge transfer, benchmarking activities, and dissemination of best practices. The continued growth of an open-source community around the OpenBEP4EU Digital Toolbox will also be important. Community contributions can support software maintenance, interoperability improvements, and future enhancements of the project's components.

Long-Term Actions

Over the longer term, OpenBEP4EU aims to position itself as a recognised reference framework supporting harmonised EPC and SRI calculations, interoperability, and digital building data ecosystems. Future activities may include alignment with emerging European initiatives related to Digital Building Logbooks, building data spaces, smart buildings, sustainable finance, and digital twin technologies [5].

Implementation of targeted communication and dissemination campaigns can increase awareness of OpenBEP4EU's value propositions and promote the adoption of its solutions across Europe. These activities may include participation in sectoral events and conferences, dissemination through specialised platforms, engagement through social media and digital communication channels, and collaboration with relevant European networks and initiatives. Emphasis will be placed on showcasing results, demonstration activities, and early adopter success stories to strengthen credibility, demonstrate practical value, and stimulate market demand [6] [8].

Another strategic objective is the continued alignment with European initiatives, policies, and funding instruments supporting the digital and green transformation of the building sector. OpenBEP4EU will seek to strengthen its positioning within the context of the Renovation Wave, the European Green Deal, Digital Building Logbook initiatives, and the Next Gen EPC ecosystem. Further opportunities will be explored through collaboration with European projects, research and innovation programmes, and national initiatives that can facilitate large-scale deployment and replication of OpenBEP4EU outcomes.

Long-term engagement with public authorities, industry stakeholders, technology providers, ESCOs, financial institutions, and European initiatives will help maximise the uptake and replication of OpenBEP4EU outcomes while supporting the implementation of the EPBD, Renovation Wave objectives, and broader decarbonisation goals across Europe [7].

7.3. Future adoption, replication and scaling opportunities

The market and policy environment surrounding building performance assessment is evolving rapidly. The implementation of the revised EPBD, the increasing adoption of Digital Building Logbooks, and the growing deployment of smart building technologies are creating favourable conditions for the wider adoption of OpenBEP4EU solutions. Through its harmonised EPC and SRI methodologies, interoperable digital infrastructure, and open-source architecture, OpenBEP4EU is well positioned to support the digitalisation and decarbonisation of the European building sector.

One important replication opportunity lies in the integration of OpenBEP4EU components into national and regional EPC ecosystems. The project's harmonised calculation methodologies, standardised data models,

and interoperable architecture can support public authorities seeking to modernise EPC schemes, implement Digital Building Logbooks, and align national frameworks with evolving European requirements [8], [9], [10].

Additional scaling opportunities arise from the deployment of OpenBEP4EU technologies by software vendors, technology providers, Digital Building Logbook operators, ESCOs, and building service providers. The availability of open APIs, BIM integration capabilities, interoperable data structures, and reusable calculation engines can facilitate the development of innovative applications and digital services supporting building performance assessment, renovation planning, and operational optimisation [5].

The increasing importance of sustainable finance also creates new opportunities for adoption. Reliable and transparent EPC and SRI data can support green mortgages, renovation loans, Energy Performance Contracting schemes, sustainability-linked investments, and portfolio analysis activities. Financial institutions are expected to increasingly require trusted building performance information to support investment decisions, regulatory reporting, and climate-related risk assessments. The long-term success of OpenBEP4EU will depend on maintaining an active ecosystem comprising public authorities, technology providers, EPC professionals, ESCOs, financial institutions, research organisations, and open-source contributors. Continued collaboration among these stakeholder groups will be essential to support innovation, interoperability, adoption, and the evolution of the project's technical assets.

Future engagement activities will focus on promoting the adoption of harmonised EPC and SRI methodologies, supporting the deployment of Digital Building Logbooks, strengthening interoperability initiatives, and facilitating collaboration across the European building performance ecosystem. These activities may include training programmes, workshops, technical support services, participation in European projects and clusters, and continued dissemination through related communication channels [5] [10].

By fostering collaboration, knowledge exchange, and community participation, OpenBEP4EU aims to ensure the long-term sustainability, replication, and scaling of its results while contributing to the digital and green transformation of Europe's building sector. Through its open, interoperable, and standards-based approach, the project provides a solid foundation for the implementation of Digital EPCs, Smart Readiness Indicators, Digital Building Logbooks, and data-driven renovation strategies across Europe.

In conclusion, the OpenBEP4EU After-LIFE Conservation Plan establishes a clear pathway for the continued exploitation, maintenance, and uptake of the project's outcomes beyond the LIFE funding period. By combining harmonised methodologies, interoperable digital tools, stakeholder engagement, capacity-building activities, and sustainable business and governance models, OpenBEP4EU is well positioned to support the evolution of the European building performance ecosystem. Through continued collaboration with public authorities, technology providers, EPC professionals, ESCOs, financial institutions, and research organisations, the project can contribute to more transparent, reliable, and interoperable building performance assessments, supporting the achievement of European energy efficiency, digitalisation, and decarbonisation objectives in the years ahead.

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