Measuring Envelope products and systems contributing to next generation of healthy nearly Zero Energy buildings

Capacity mapping concept of the MEZeroE platform

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Executive summary

Technological innovation in the construction sector is considerably difficult to implement due to several factors such as the fragmentation and complexity of this sector. Many disciplines are involved at various stages, design and production are usually separated, there is a large number of players with a vast majority of small-medium enterprises (SME), and supply chains are long and variegated. As a result, gathering the different specialists together is difficult, and many potentially effective innovative solutions do not even reach the market.

H2020 MEZeroE project aims at tackling this complex issue by creating an EU distributed open innovation ecosystem for (i) developing nearly Zero Energy Building (nZEB) Enabler Envelope technology solutions; (ii) transferring knowledge; (iii) matching testing needs with existing facilities; (iv) providing monitoring in living labs; and;(v) standardizing cutting-edge solutions coming from SMEs and larger industries, to foster inclusive change in the building sector, being accessible via a single-entry point to all users.

MEZeroE ecosystem is accessed via a single-entry point web-based multi-side virtual marketplace which will include 9 Pilot Measurement & Verification Lines (PM&VL), 3 Open Innovation Services (OIS), and resources for training, business model development, systematic intellectual property (IP) and knowledge management. MEZeroE will fast-track prototypes to the market as fully characterized products.

Potential contents of MEZeroE digital platform as description and capacity of testing and consultancy services were mapped in a structured, and comprehensive framework. The platform has been meticulously populated to serve as a robust resource for various stakeholders in the nZEB envelope technologies sector. The platform now hosts information on PM&VLs, OISs, and their characterisation, including dedicated sections for public and private access. It also integrates initial success stories to showcase the tangible value and impact of the services offered, detailed descriptions of Living Labs, and resources such as the BIM Package Configurator and a common glossary.

These contents transform the MEZeroE platform into a practical, single-entry point. It empowers SMEs, industry players, and researchers to readily access a wealth of knowledge, state-of-the-art testing facilities, and cutting-edge innovation services. The platform was designed and organised to significantly accelerate the research, development, and widespread adoption of innovative building envelope technologies, supporting industry players (demand) in the pathway from idea to market with different kind of services (offer), while contributing to a more sustainable built environment.

It offers comprehensive descriptions of testing facilities spread across Europe, giving access to registered users to technical information as well as information about testing facilities locations, so that the choice of the facility to boost innovation development can take into account different aspects, not last the proximity and the possibility of interacting in native language with the service provider. Additionally, the project elaborated information about volumes of testing offer that a facility can guarantee (e.g. number of testing that can be conducted in a time slot, in parallel and during a year). This information is not of immediate use for customers, thus are not visualised in the platform, but has been used to elaborate scenarios of possible turnover generated by each testing facility and contribute to the assessment of the overall sustainability of the MEZeroE offer in the longer run.

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List of acronyms

BIPV	Building Integrated Photovoltaics
BIM	Building Information Modeling
IEQ	Indoor Environmental Quality
LL	Living Lab
nZEB	nearly Zero Energy Building
OIS	Open Innovation Service
OITB	Open Innovation Test Bed
PM&VL	Pilot Measurement and Verification Line
SME	Small Medium Enterprise

1. Introduction

1.1. Objectives of the Capacity Building activity

The main goal of the activities described in this document is to plan and implement the transfer of knowledge and information developed whitin the MEZeroE project into the digital platform, while quantifying the capability in providing testing and consultancy services by research and technology organizations (RTO). This requires:

- Translation of the research project jargon and technical terminology into a common and accessible language, closer to the external stakeholders of the MEZeroE platform
- Identification of content of interest for platform visitors, with the double purpose of valorising the portfolio of services offered and explaining how these services can be used and generate value.

When it started, the task description has been refined: instead of focusing on the technical creation of the initial service map (already completed in earlier phases of the project), the task concentrates on collecting and updating the knowledge to be provided through the platform, using the most appropriate language and format, to facilitate the transfer to the ecosystem of Open Innovation Test Bed (OITB) stakeholders. A clearer definition has also been introduced on how to describe the capacity of services, for both Pilot Measurement and Verification Line (PM&VLs) and Open Innovation Services (OISs) (e.g. number and duration of tests, production of technical documents, and exchange workflows). Part of this information has been used to create scenarios of economic return from commercial offering of these services, to assess the sustainability of the platform services. Other information (detailed workflows with interactions among the testing facilities and the customers) as well as structure of input data and reports returning the outcomes of text), have been generalised to avoid making the interaction too rigid and to accomodate a more flexible way of interaction. This choice does not diminish the value fo the platform-based interaction and keeps open the possibility of adding new testing facilities without a limited effort.

1.2. MEZeroE digital platform: short description of main services and stakeholders

The main goal of the MEZeroE web-based platform is the creation of a virtual space where all the actors involved in the development of nZEB Enabler Envelope Solution offer and retrieve knowledge, processes and services to support products innovation pathways, using an open innovation approach. Figure 1 shows the platform homepage.

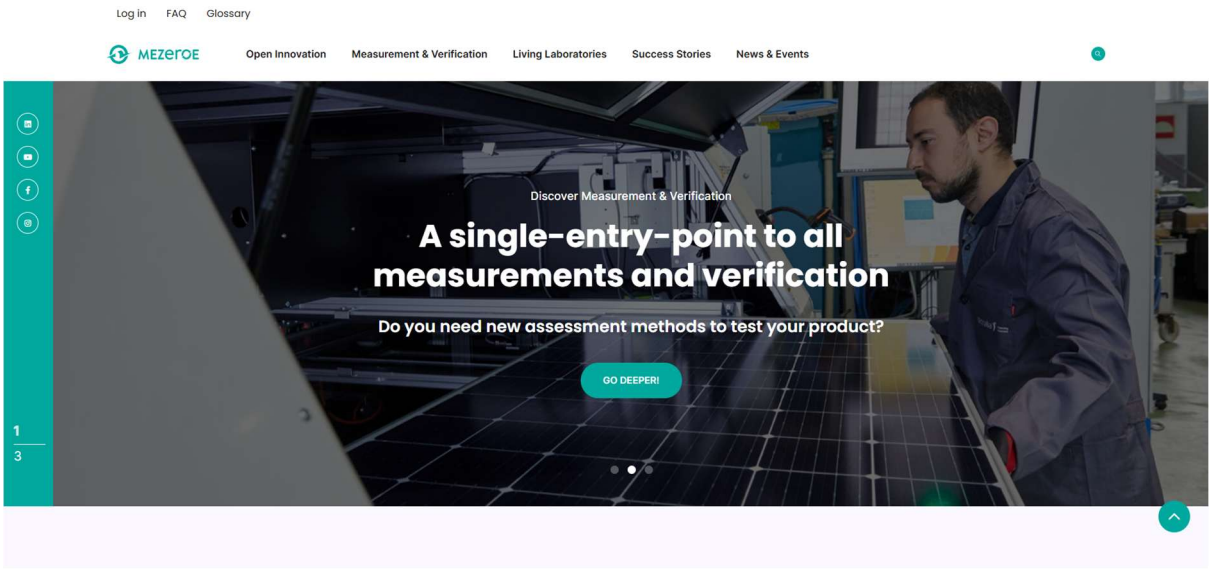


Figure 1: Homepage of the MEZeroE platform

The platform operates as a multi-sided virtual marketplace, hosting two main categories of services:

- **Testing** through 9 **Pilot Measurement & Verification Lines** (PM&VLs), providing advanced testing and validation facilities:
  - Advanced BIPV and hybrid PV/T systems characterisation facing Efficiency and Safety requirements,
  - Building envelope/IEQ interaction facing Health requirements,
  - Active energy component characterization facing Efficiency requirement,
  - Visual and thermal performance analysis of dynamic glass systems facing Efficiency requirement,
  - Building/user interaction characterization facing Efficiency requirement,
  - Multi-layers dry nZEB Enabler Envelope Solutions (nEES) characterization facing Healthy and Safety requirement,
  - Mechanical resistance and stability characterization of connections/joints between component materials and supporting structures facing Safety requirement,
  - Solar gain control in semi-transparent envelope component, facing Healthy requirement,
  - Wooden prefab components assessment line facing Safety requirement:

- **Consultancy** through 3 **Open Innovation Services** (OISs), supporting innovation pathways:
  - Standard framework procedures for certification and marking,
  - Cost-effective monioting smart kit for living labs,
  - Guidance for open innovation life cycle management;

The MEZeroE platform is designed to attract a diverse range of stakeholders crucial to the promotion of innovative solutions in the building envelope sector. This includes a primary focus on Small-Medium sized Enterprises (SMEs), recognizing their vital role in innovation and economic growth within the building industry. The virtual marketplace also targets larger industry players, encompassing manufacturers, suppliers, and contractors who are directly involved in the design, production, and installation of building envelope components and systems. Furthermore, RTOs are key beneficiaries,

as the platform provides a link for collaborative research and the dissemination of cutting-edge technological innovations. Finally, experts from the Architecture, Engineering and Construction (AEC) sector are directly addressed, ensuring that the platform's resources and tools are relevant to their daily practices. By addressing this broad spectrum of stakeholders, the MEZeroE platform aims to foster a collaborative ecosystem that accelerates innovation, improves efficiency, and promotes sustainable practices across the entire building envelope value chain.

1.3. Connection with other project activities

The activities described in this document play a key role in the project framework, acting as a bridge between the development of an offer for innovative services, Living labs and BIM configuration tools and their integration into the MEZeroE digital platform. The outcomes of previous activities, in particular the set-up of the Pilot Measurement & Verification Lines and the Open Innovation Services, and the developement of a “BIM configurator tool” , provide the main content that feeds into the platform The network of Living Labs characteristics and offer in terms of product validation services is also part of the knowledge available on the platform. The activities described in this report primarily aimed at transforming the technical descriptions of these services and tools into clear and understandable information and workflows to easily browse, search, and access them in the MeZeroE platform, avoiding technical jargon and separating more general presentations, accessible to any visitor of the platform and aimed at offering simple but catching representation of the MEZeroE offer, from more detailed ones, available to registered users expressing interest in specific services.

1.4. Structure of the report

The document has been structured into 8 main sections:

- Section1 provides an overall introduction to the report
- Section 2 explains the development of a common language for MEZeroE ecosystem
- Section 3 describes the 9 Pilot Measurement & Verification Lines (PM&VLs)
- Section 4 presents the 3 Open Innovation Services (OISs) and related subservices
- Section 5 delves into the production and publication process of success stories
- Section 6 describes the creation of Living Labs identity cards
- Section 7 focuses on the integration of the BIM Package Configurator into the MEZeroE platform
- Section 8 outlines the report conclusions
- Appendix 1 includes templates used to create success stories and identity cards of the MEZeroE Living Labs

2. Development of a common MEZeroE language

2.1. Objectives and performed activities

The necessity of defining a **common language** arises from the diverse backgrounds of the stakeholders involved in the MEZeroE project, includind industry representative, research organization, suppliers and consultants, and from the need of easily communicate with the ecosystem of the OITB users. The MEZeroE consortium consists of scientific and technical partners who are used to the so-called "EU project terminology" that, when used to communicate outside the project can create barriers to comprehensive understanding and collaboration with external entities, who may not be familiar with such jargon. By establishing and consistently using a common language, the MEZeroE ecosystem aims to bridge communication gaps, foster effective collaboration, and ensure that valuable information is accessible and understandable to all relevant parties, ultimately maximizing the impact and success of the project outcomes.

The **target audience** for this common language spans a wide range of actors along the innovation pathway of building envelope products and solutions, including:

- Scientific and technical organization: to ensure to define a robust and well addressed experimental design, as well as clear communication of research findings and technical specifications
- Industry professionals: to facilitate the search of suitable services and trainings considering the maturity of product innovation, and adoption of new technologies and methodologies
- Policy makers: to enable informed decision-making and the development of supportive regulations to facilitate open innovation processes and adoption of well-assessed new products
- End-users: to widespread the innovation process results and to ensure their practical applicability and usability by SMEs and building professionals
- Living Lab participants: to foster effective engagement and feedback loops
- Open Call applicants: to ensure a clear understanding of call requirements, ambition, challenges, and objectives

This newly defined common language is strategically implemented across various project activities and outcomes, including:

- MEZeroE Platform: serving as the central hub for information exchange
- Testing and validation activities: to standardize procedures, interactions between demand and offer parties and reporting, ensuring reliable results
- Living Labs: to facilitate seamless interaction and knowledge sharing with participants in real-world scenarios starting with building owner, manufacturer(s), and process manager, but also including general contractor, suppliers, installers and building users
- Dissemination & Communication activities: to ensure clear and consistent messaging to a broad audience
- Open Call activities: to clearly articulate the scope and expectations for from cascade actions

On the path towards defining a common language, the collaboration between project partners has been fruitful, in making the platform accessible and engaging for users. The different sections of the public part of the platform were designedwith texts and infographics that could be easily understood. The platform's appeal and service presentation have been improved through time, having understood the importance of a common language and its practical application within the MEZeroE ecosystem. Feedback on preliminary versions helped redefining service titles and descriptions and carefully selecting images that best represented the activities performed and the essence of each service or test. A strong emphasis has been placed on simplification, proposing the use of infographics and icons to facilitate easier consultation and understanding of the topics covered. The final mockups reflect these suggestions and served as a guide for implementing the graphic layout.

In the remainder of this document, some examples of abbreviations and substitute terminology used will be highlighted.

The successful development and application of the common MEZeroE language has been pivotal for the project, bridging the communication gap between the technical aspects of the platform and the broader dissemination and communication efforts. The unified terminology was consistently applied across both the MEZeroE platform and all project's communication and dissemination materials, as well as the MEZeroE project website.

2.2. MEZeroE FAQ and Glossary sections

Always to ensure a clear and coherent experience for users, two sections have been developed dedicated to facilitating the understanding of the project to the visitors of the platform.

The **FAQ** section collects 10 questions that aim to clarify in a synthetic way the fundamental aspects of the project.

1. What is a PM&VL?
2. What is an OIS?
3. What is a real-building living lab?
4. What is a TRL?
5. How do PM&VLs, OISs, and LLs relate to TRL?
6. What is Open Innovation? What is the difference between open and closed innovation?
7. What is the aim of MEZeroE?
8. What will MEZeroE initially offer?
9. What is the overall challenge that MEZeroE aims to address?
10. What is an OITB?

Below is the link to the FAQ page where the answers to the questions listed above are available: https://mezeroe-platform.eu/faq while Figure 2 shows the same section available on the platform.

The selection of these 10 questions was the result of a joint work with the various project partners in identifying the primary aspects to be made clear to the users.

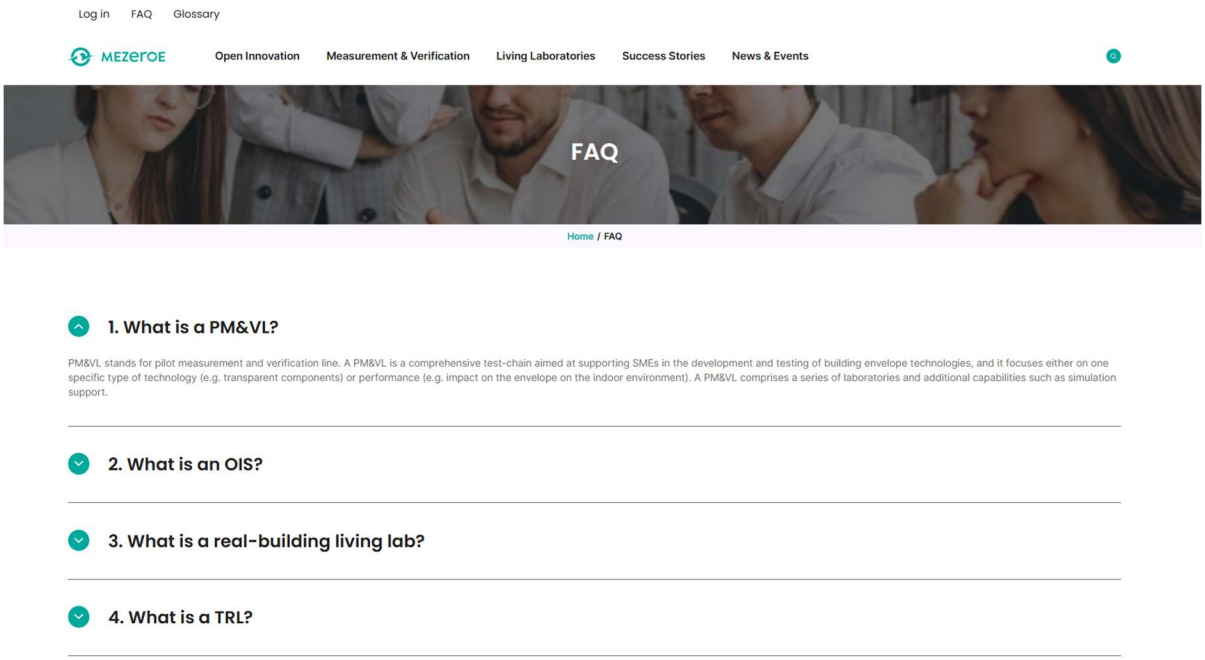


Figure 2: FAQ section on MEZeroE platform

The **Glossary** section contains the list of the most recurring terms and acronyms with their definitions, as illustrated in Figure 3.

The selection of terms to be included in this section was validated by the project partners during the platform exploration activities. The acronyms and abbreviations in this list were selected because they are widely used in the platform's communications materials. Some of these terms are already used on the homepage and in the sections presenting the services, so it's important to clarify their meaning and include them in this section.

Below is a list of acronyms and abbreviations currently present in this section:

- BIPV: Building Integrated Photovoltaics
- ETA: European Technical Assessment
- IEQ: Indoor Environmental Quality
- IND: Industry
- IPR: Intellectual Property Right
- LL: Living Lab
- M&V: Measurement and Verification
- nEES: nZEB Enabler Envelope Solution
- nZEB: Nearly Zero Energy Building
- OIS: Open Innovation Service
- PM&VL: Pilot Measurement and Verification Line

- PV/T: Photovoltaic / Thermal
- RTD: Research and Technology Development
- SME: Small Medium Enterprise
- TAB: Technical Assessment Body

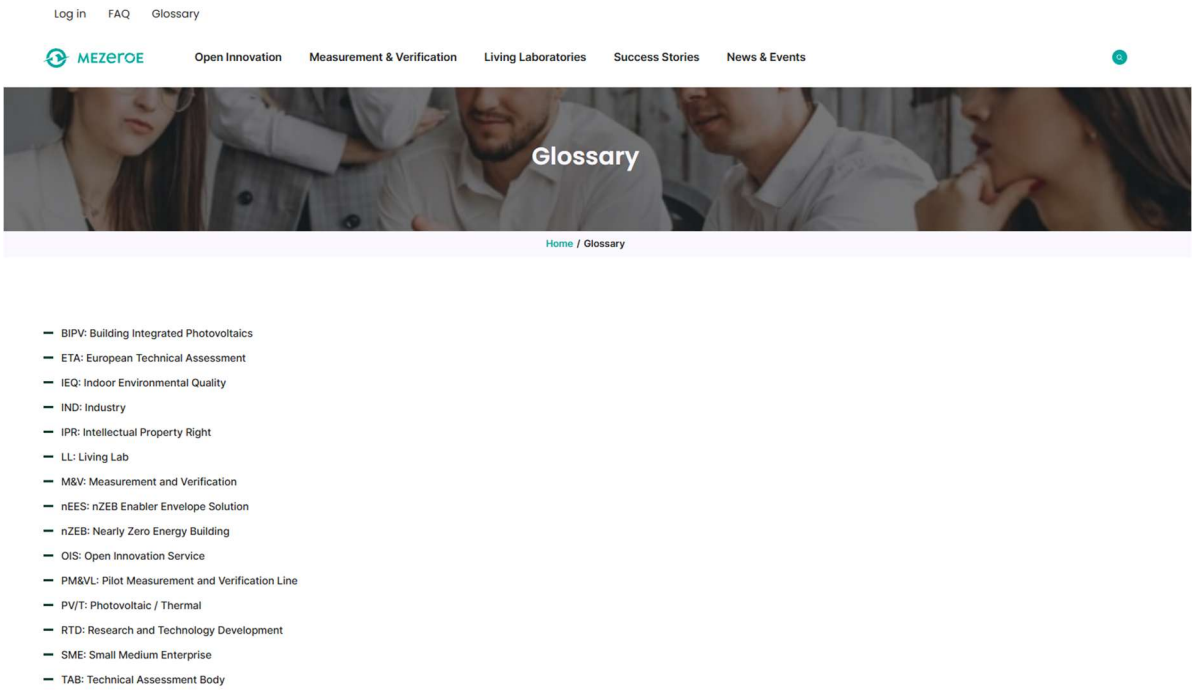


Figure 3: Glossary Section on the MEZeroE platform

Given the highly informative and explanatory nature of these pages of the Platform, they will be subject to revisions and updates throughout the project duration and after its conclusion. A further opportunity to improve these sections will be the inclusion of early adopters and open call winners in the validation activities. These two new user categories will be encouraged to suggest new questions and terms to improve the FAQ and Glossary sections. It's also important to note that these users are external to the project partners and therefore represent an important resource capable of providing feedback and insights that are particularly valuable for expressing concept and making the the terminology used on the platform more understandable.

An important step in this direction from an operational standpoint was the development and sharing, during an in-person meeting of a mixed-format validation questionnaire: open-ended questions and a questionnaire for calculating the System Usability Scale score. Participants explored the homepage and the related pages and then answered questions specifically designed to assess the completeness and ease of access to basic concepts regarding the MEZeroE ecosystem.

Although it involved only internal MEZeroE partners, this step yielded valuable insights and confirmed the chosen engagement and validation approach. The format will be extended and replicated to external consortium members in future iterations. Specifically, the mixed-format validation questionnaires developed will be extended to include other sections of the platform. These questionnaires will be sent to project partners via email. Partners will also be encouraged to complete

them during in-person events. Particular attention will be paid to involving users outside the consortium at this stage: early adopters, open call winners, and contacts within the partner network.

3. Open Innovation Services description

This section outlines the process of preparing and integrating crucial information regarding available Open Innovation Services (OIS1, OIS2, and OIS3) into the MEZeroE platform. The overarching goal is to ensure that these services are not only accurately represented but also easily comprehensible and accessible to a diverse user base.

3.1. Methodology for collecting and structuring OISs data

The initial data collection has been done in previous project activities aiming to set-up the OISs: this involved the initial characterization of each individual OISs, generating detailed technical extensive data. All this information necessitated a subsequent process of simplification and translation: in collaboration with the partner responsible for each specific service, the complex technical jargon has been "translated" into a user-friendly, common language that could be understood by a wider audience. To standardize this data collection and ensure consistency across all OISs, a dedicated **template** was developed and widely distributed among the partners. This template served as a structured framework for collecting key information deemed essential for publication on the MEZeroE platform.

For each OIS and its associated subservices, the following critical information is collected and prepared for publication on the MEZeroE platform:

- **Name and subtitle of the subservice**: providing a clear and concise identification of each distinct offering within an OIS
- **Short description**: a brief informative overview that quickly conveys the essence of the subservice
- **Process description:** an explanation of the steps involved in utilizing or engaging with the service, outlining its operational flow
- **Main objective:** the primary goal or benefit that the service aims to achieve for its users
- **Technology Readiness Level (TRL):** the maturity level of the service, providing users with an understanding of its developmental stage and readiness
- **Picture:** to exemplify the service and to enhance its appeal

Beyond the technical simplification, significant discussions were held to determine the appropriate level of public accessibility for the collected content. Consequently, decisions were made regarding which content would be freely and publicly accessible to all platform visitors and which would be exclusively reserved for registered users, to respond not only to the need of avoiding unnecessary technicalities to visitors, but also to protect the sensitivity of the information.

The following images aim to visualise the process previously described, through a real example: starting from the filling of the initial template with information regarding the OIS 1 (Figure 4.a), then a more specific template more user oriented filled in with the collaboration with the related service provider (Figure 4.b) until the final upload in the Platform (Figure 5).

Open Innovation Service Brief Description
The provision of the OIS1 service is supporting open innovation process meaning that (standard) procedures for certification and marking are adapted to the selected product.

Open Innovation Service Extended Description
OIS 1 service includes multiple subservices presented listed here: - Identifying the best methods for product characterization. - Guiding product design by focusing on regulation. - Defining lists of necessary tests for product certification. - A clear informative path to CE marking including: Technical guidance for producers and for laboratories; Procedures for the evaluation of the innovative products; Possible procedures for product certification. - Support of background data for verification of the test results to assess reliability of the experimental methods. - Providing ready to use approaches regarding evaluation of economic rationale towards circular economy, environmental-social audits, LCA and LCC analysis. - Support methods for digitalization of the construction products.

Open Innovation Service Characteristics
The subservices 1 - 3 have in common that they provide manufacturer a list of necessary tests that they need for product characterization, CE marking or that the designed product is in line with regulation. Rest of the subservices focus on preparation of all the documents that the manufacturer needs for submiting for CE marking, different life cycle/cost analysis, environmental-social audits and support with product digitalization - from catalogues to data needed for different databases and more.

Figure 4.a: Initial template filled-in by the service provider for the Platform

- IDENTIFICATION OF THE BEST METHODS FOR PRODUCT CHARACTERIZATION

Subtitle:

A deep look into product's broad characteristics

Text:

The process will start looking at essential characteristics of your product. Most of them will be handled by routine methods, but in case of special ones will be develop a testing path with an expert support. This innovative method selection identifies and provides a fast and affordable path to certification for new product not fully covered by established tests.

TRL:

From 4 to 8

Process description of the service:

This service will support IND partners **from the design phase**. Indeed, the process gathers client's products characteristics at first stage. Secondly a list of possible pre-defined test categories for product characterization are identified. At the end the best test method is chosen and a report of product's certification is delivered. If necessary, meeting/call for support with the client will be organized.

Main objective:

Potential topics for this characterization path are related to thermal and comfort in façade systems, or PV energy performance, or hygrothermal performance, etc., except for electricity, electronics, machines, etc.

Figure 4.b: Example of the more specific template filled-in in collaboration with the service provider for the Platform

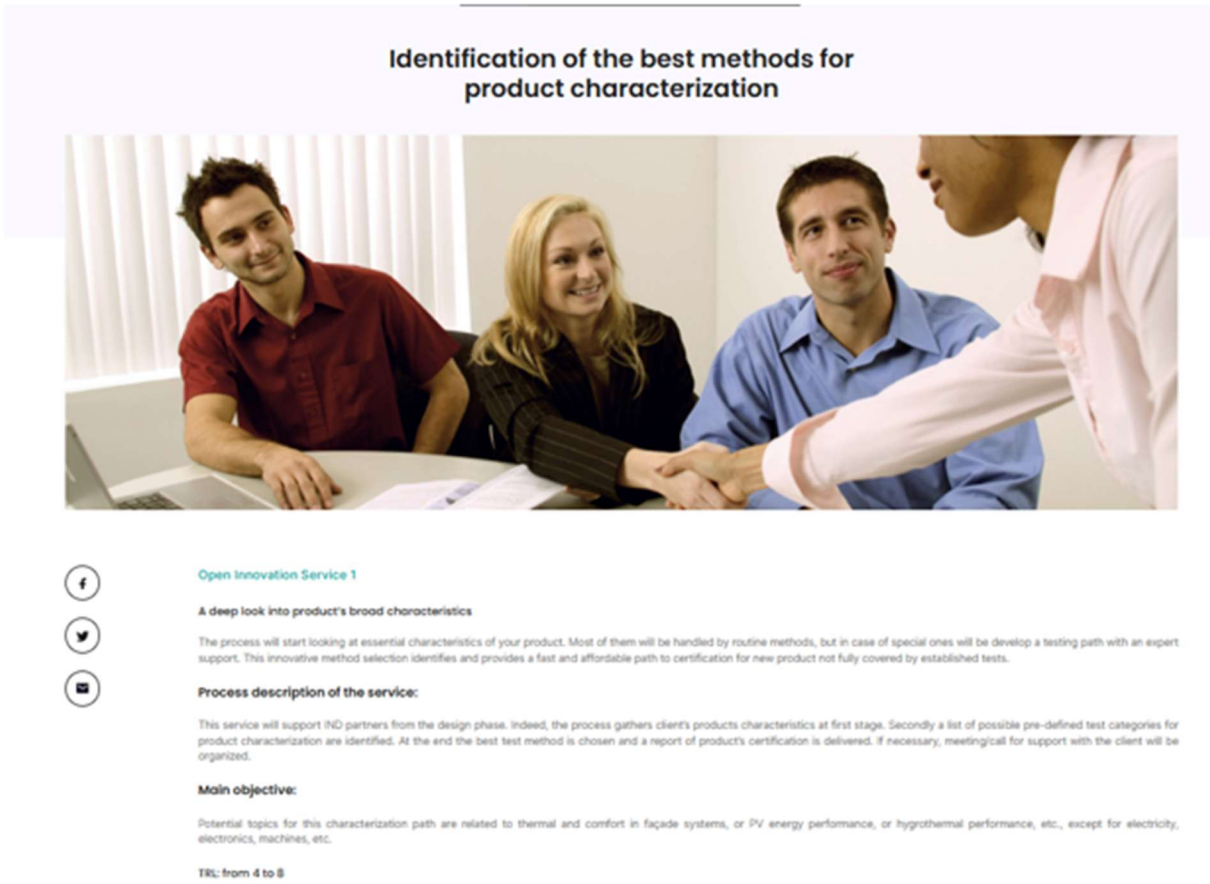


Figure 5: Same subservice information available in the public area of the Platform

3.2. Public and private part interface approach

Alongside the information gathering phase, the interface dedicated to containing this information was defined.

In designing the public section dedicated to open innovation services, particular emphasis was placed on expressing the concept of open innovation and the salient characteristics of the three open innovation services and the related subservices present in MEZeroE in a simple and incisive manner.

This led to the following decisions:

- Changing the section's name from "Open Innovation Services" to "Open Innovation"
- Establishing a motto, "From first idea to market through collaborative innovation," which sums up the essence of the services provided in a few words.
- A few simple lines to define what MEZeroE represents in terms of Open Innovation Services:
- "MEZeroE ecosystem offering open access to knowledge, know-how, technologies, products, and services that ZEB stakeholders can provide. Any own challenge can become an open innovation challenge: sharing risks, enhancing processes, and the probability of success will help bring several more ideas to the market effectively!"

- Access to the description of the three open innovation services
- Access to the description of all sub-services, filterable using a dedicated feature.

A second focus was creating a path that would lead users from the public to the private section. The detail pages include calls to action that motivate users to explore further by registering.

After registering, the user will be able to access their private area. Through the Services section of the private area, the user can request access to all the sub-services they have explored in the private area. To minimize the interface clutter, we have chosen to use the same sub-service descriptions found in the public area in the private area as well. However, these descriptions are supplemented by descriptions of the experts who can offer these services. Furthermore the photos representing each service are also displayed in the private area, creating a pattern that makes it easier for users to recognize, explore, and then request a service.

As will be described in more detail in the following paragraphs, following the request to activate a service, various features are made available to the user for exchanging information with service providers.

The following chapters describe in detail the features and information available in the public and private sections.

3.3. OISs content accessible in the public area of the platform

In this section the user can access the pages dedicated to the descriptions of the three Open Innovation Services. Each page contains a representative photo and a brief description of the service. In addition to a general description of the three Open Innovation Services, all the sub-services associated with them are also included. For each sub-service, a representative image and a brief description have been included. The descriptions accurately reflect what is indicated in the detailed template described in section 3.1 of this document.

This was followed by a validation and approval phase of the interested partners who collaborated in choosing the representative image of the various subservices.

The OIS subservice **filtering function** is based on the decision tree below represented as an excel file in Figure 6.

A	B	C	D	E	F
OIS Title	reference question		reference question	OIS subservice	
Do you need a roadmap to follow to reach your product certification or characterization?	OIS1	Do you need a support to reach the certification of your product?	Do you need a support to design your product in order to meet the regulatory requirements to be placed on the market?	Guiding product design by focusing on regulation	
			Do you need to define the list of necessary tests for product certification according to the product characterization and its intended use, based on the current regulation and standards?	Defining lists of necessary tests for product certification	
			Do you need a defined path to follow in order to enable an innovative product to be CE marked?	A clear informative path to CE marking	
		Do you need a support to characterize your product with tests	Do you need an advise on which testing methods would be needed to obtain your product's characterization?	Identification of the best methods for product characterization	
			Do you need a support in terms of background data for verification of the test results to assess reliability of the experimental methods?	Support of background data for verification of the test results to assess reliability of the experimental methods	
		Do you need a support to define additional information for your product related to circularity and digitalization?	Do you need a support to gather the necessary data for evaluation of indicators regarding circular economy, environmental-social audits, LCA and LCC analysisc?	Ready to use approaches regarding evaluation of economic rationale towards circular economy, environmental-social audits, LCA and LCC analysis	
			Do you need a clear overview of all the available options to position a construction product in the digital ecosystem?	Support methods for digitalization of the construction products	
Do you need monitornig services?	OIS2	Do you need a monitoring system focused on indoor comfort conditions?	Do you need monitoring services for IAQ?	Indoor air quality monitoring	
			Do you need post occupancy evaluation?	Post occupancy evaluation	
			Do you need monitoring services for thermal comfort evaluation?	Thermal comfort study	
			Do you need monitoring services for acoustic performance evaluation?	Acoustic performance study	
		Do you need a monitoring system focused on building energy performances?	Do you need monitoring services for energy consumption/saving?	Energy consumption/saving study	
			Do you need monitoring services for façade performance evaluatin?	Façade performance evaluation	
			Do you need monitoring for a certification scheme?	Certification scheme	
			Do you need a pre- and post- retrofit analysis?	Pre-post retrofit analysis	
			Do you need experts to guide you through the definition of an entry	Expert mentorship in accessing other markets	

Figure 6: OIS decision tree information flow

This filtering function is proposed in the platform through a simple question: *What kind of service do you need?*

Through the drop-down menu illustrated in Figure 7, the user can answer by selecting alternatives that will lead him to the services of his interest.

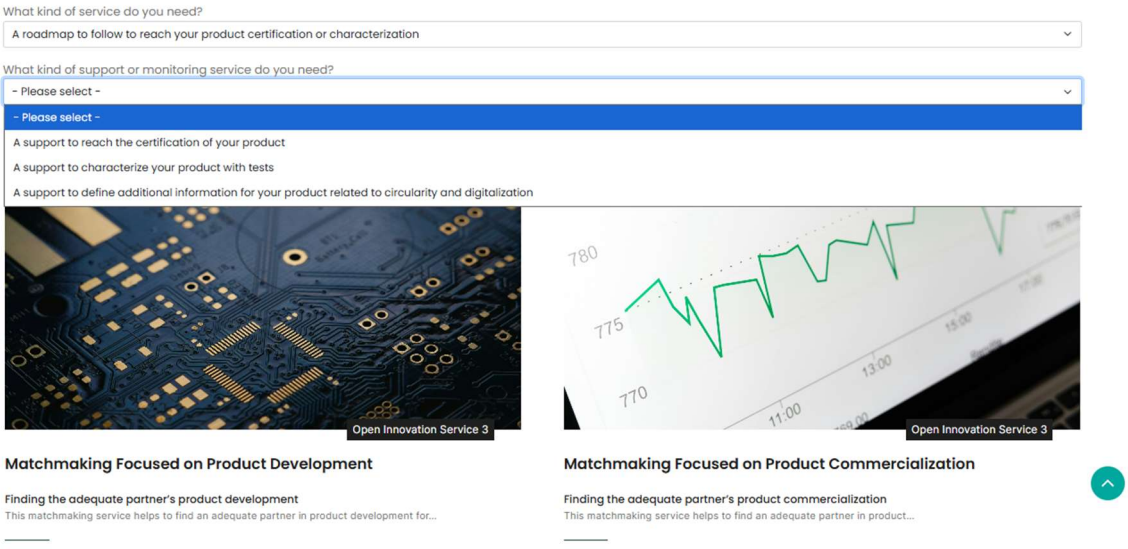


Figure 7: Dropdown menu filter for the Open Innovation subservices

3.4. OISs content accessible in the private area of the platform

The **private part** of the platform is accessible only to registered users, that are expected to be a restricted set of platform users, that have specific interest for Open Innovation services and more familiarity with technical language.

During the registration process, users can choose between the following roles:

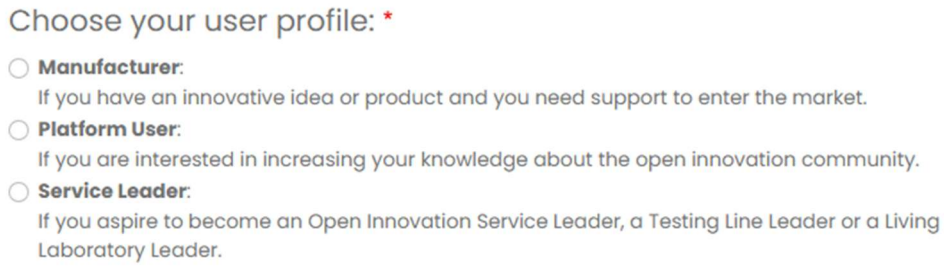


Figure 8: User profile roles

Depending on the role selected, the user will be able to access a different set of features. The following is the navigation flow for the **Manufacturer** role, which is particularly useful for showing how OIS information has been included in the private section.

By entering the Services section and selecting the Open Innovation tab, the Manufacturer can access the list of services and filter them with the same system present in the public part. Once the service of interest has been identified, the producer can select it, read the details and view the list of experts able to provide the service. He can then send a request to the expert of his choice by filling out a simple form, as illustrated in Figure 9.

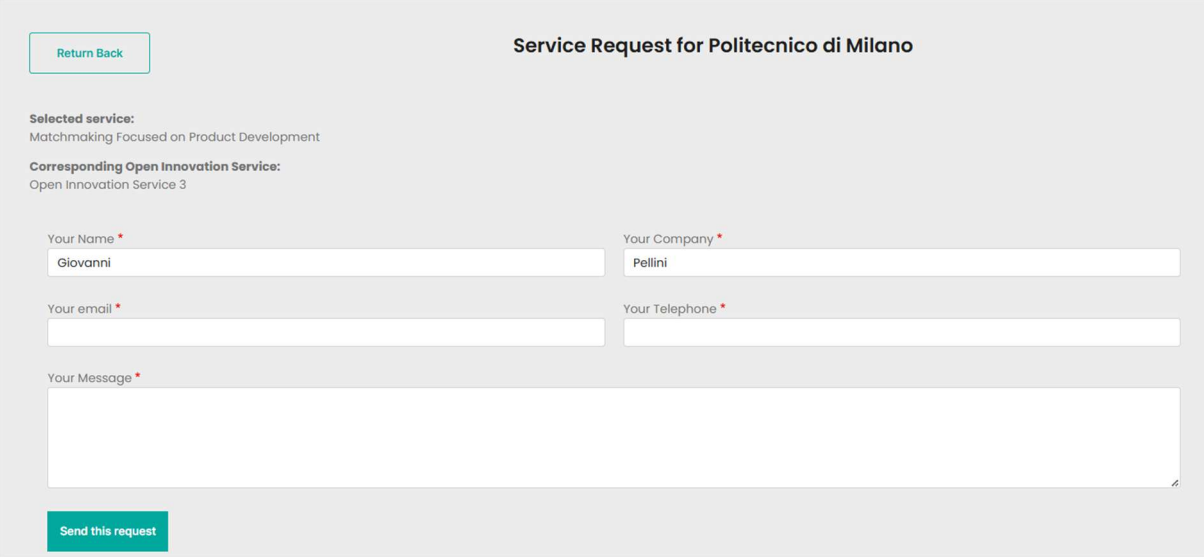


Figure 9: Service request for a service expert

The request will be delivered to the selected expert and will always be available in the My Requests section of the user, as shown in Figure 10. From this moment on, the Manufacturer user and the expert providing the service can begin exchanging information and documents through the features offered by the platform. Specifically, through the input and output document functions, the Manufacturer can send and receive reports and detailed documents regarding the services and tests conducted.

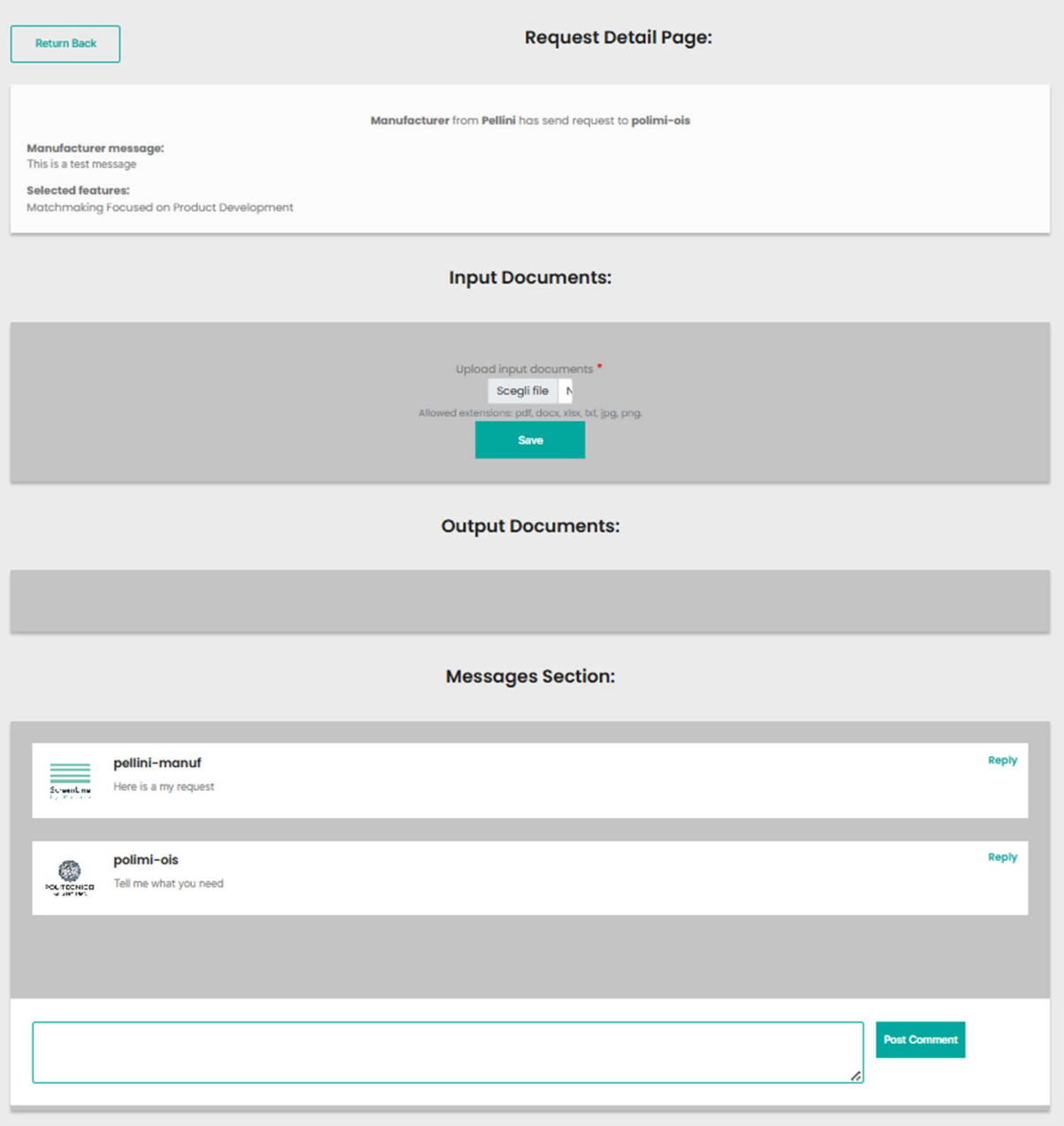


Figure 10: Example of a follow-up for a service request

As for the **service expert**, as anticipated, the navigation flow is different. After registration, the aspiring service provider will be able to browse the available services, read their description (see Figure 11) and send a request to join the expert list (see Figure 12). If this request is approved, the expert, after logging in, will be able to receive requests from producers interested in his service and start an exchange of information.

The MEZeroE Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 953157

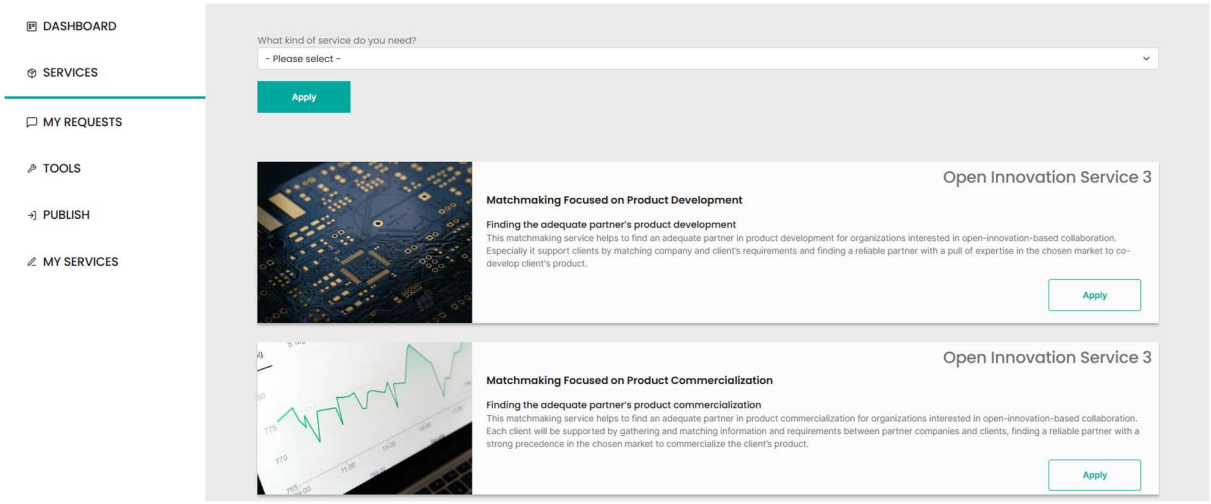


Figure 11: Services section for an aspiring service provider

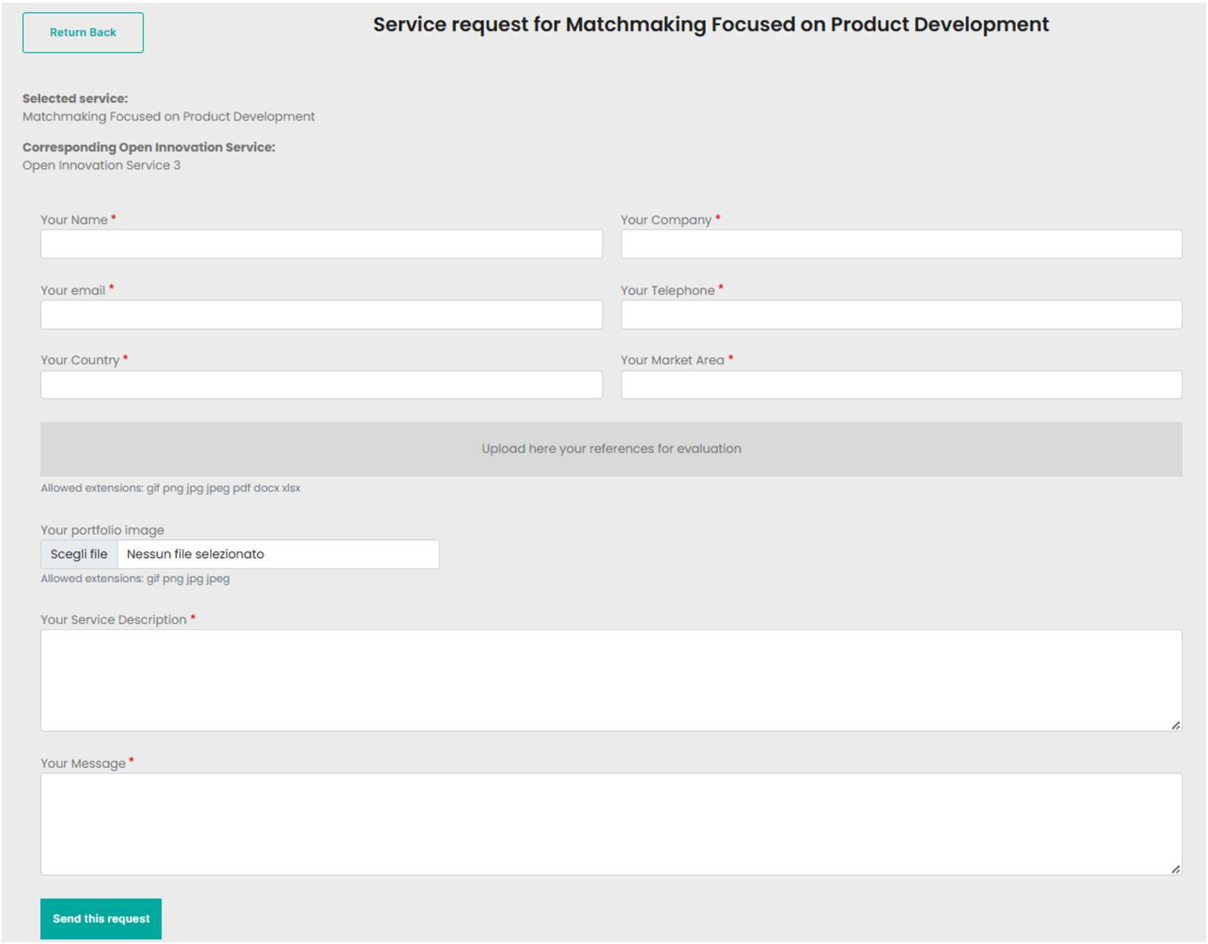


Figure 12: Application request to be included in the list of service providers

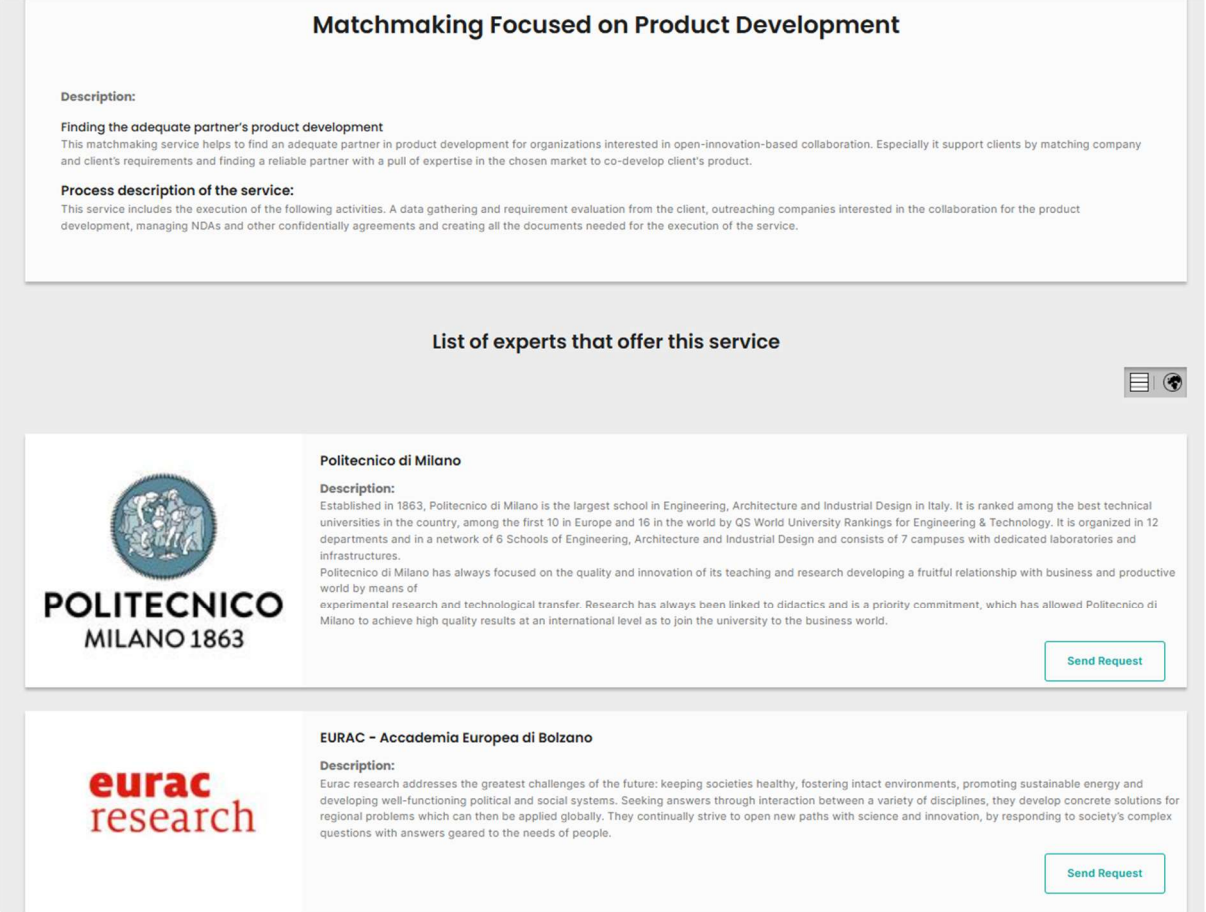


Figure 13: List of entities offering a specific Open Innovation service

The main interaction tool is therefore represented by **service requests**, which offer the possibility of exchanging information and documents and make matchmaking between the interested parties concrete.

4. PM&VL description

The approach followed for gathering information and structuring the data related to Pilot Measurement & Verification Line (PM&VL) mirrors the methodology already described in the previous section focused on the OISs characterization. Data collection was carried out in previous activities related to the set-up of the PM&VL as unique test chain in the MEZeroE ecosystem. A common process and shared terminology were defined to ensure consistency, facilitate coordination among partners, and standardise the collection of data. This process also allowed the analysis of results from the first trials. Each partner responsible for a PM&VL was asked to fill in a dedicated **template**, as illustrated in Figure 14, providing both textual information and visual material (such as images of the testing facilities).

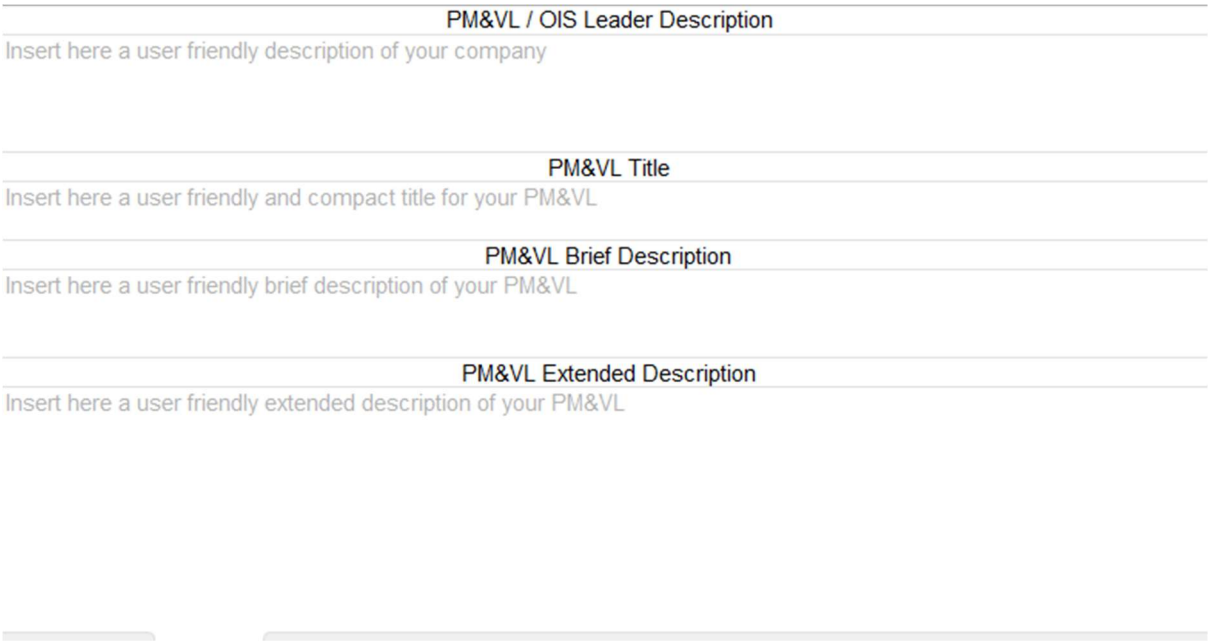


Figure 14: Information collocation template for PM&VLs

This material was then further refined into mockups (see Figure 15, 16) to renew both the PM&VL section as a whole and the pages dedicated to the 9 PM&VLs. The review focused primarily on two fronts:

- standardizing the descriptions of all PM&VLs using a common language accessible to the average MEZeroE stakeholder.
- Creating a graphic narrative that immediately represents the application context and the services offered.

Regarding the first point, the titles were shortened and simplified. The descriptions were summarized and stylistically standardized, avoiding terminology that was too project-specific. Below is an example of the work done comparing a title and description before and after the review:

First title of the PM&VL 1: *Advanced Building Integrated Photovoltaic (BIPV), Solar Thermal (BIST) and Hybrid Solar Photovoltaic/Thermal (BIPV-T) systems characterization facing Efficiency and Safety requirements*

Abbreviated title of the PM&VL 1 after review: *Safety, performance and efficiency characterisation of building integrated photovoltaic, thermal and hybrid systems*

First brief description of the PM&VL 7: *The main objective of PM&VL7 is development of specific testing procedures for evaluation of connectors safety, considered as joints between envelope components and connections between envelope panels and structural elements. The proposed pilot line allows users to carry out typical tests on connections and to examine their safety in use, with reference to vibro-acoustic and thermo-humidity comfort (defined in European standards as well as not defined there). As an added value, the PM&VL7 includes additional tests characterizing the impact of environmental, chemical, biological and mechanical factors (durability) on the reduction of safety in use of connections and loss of vibro-acoustic and thermo-humidity parameters of nZEB elements due to action of these deteriorating factors.*

Abbreviated brief description of the PM&VL 7 after review: *Offers a valuable benefit by providing a comprehensive testing platform. It allows you to evaluate the mechanical and durability aspects of connectors in nZEB envelopes, ensuring optimal comfort and performance in your projects. By understanding the impact of various factors on connection safety and performance, you can confidently choose the most suitable connectors for your specific needs, enhancing overall project quality and user satisfaction.*

Regarding the second point, representative images were selected for each PM&VL and a simplified visual language was developed using icons. Below are some excerpts from the mockup that are very similar to the current version of the platform.

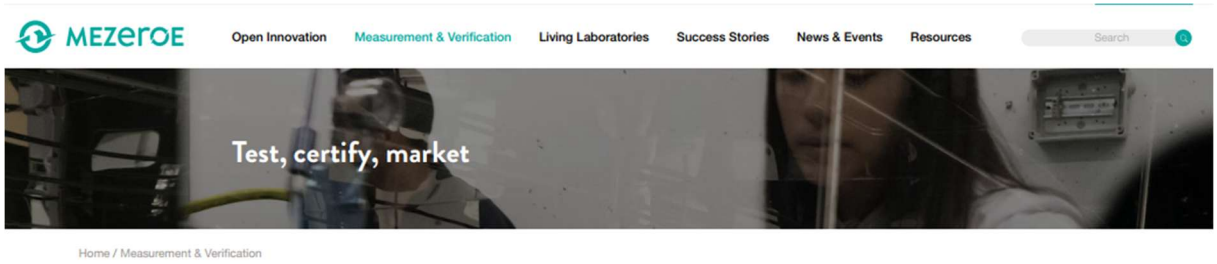


Figure 15: Mockup of the PM&VLs section of the Platform

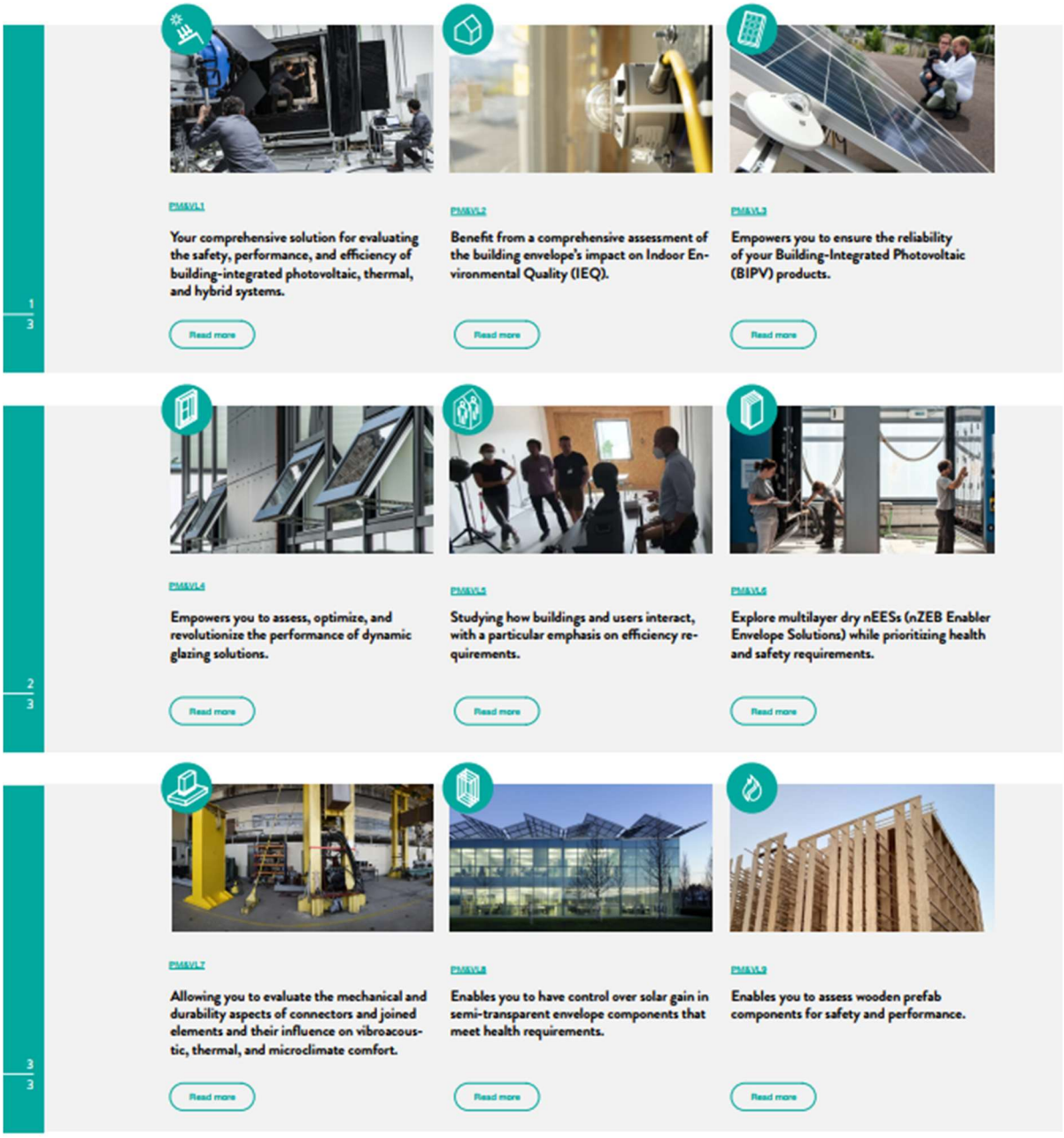


Figure 16: Mockup of the PM&VLs section of the Platform

Following data collection, a selection process was applied to determine what content should be made available in the public area of the platform and what should remain accessible only to registered users in the private area. As a result:

- in the **public area**, a dedicated showcase section presents general information about each PM&VL to all MEZeroE platform visitors (see Figure17)

- in the **private area**, the PM&VL responsible partners uploaded detailed descriptions of their facilities features, indicating the available tests and enabling richer interaction and supporting project activities

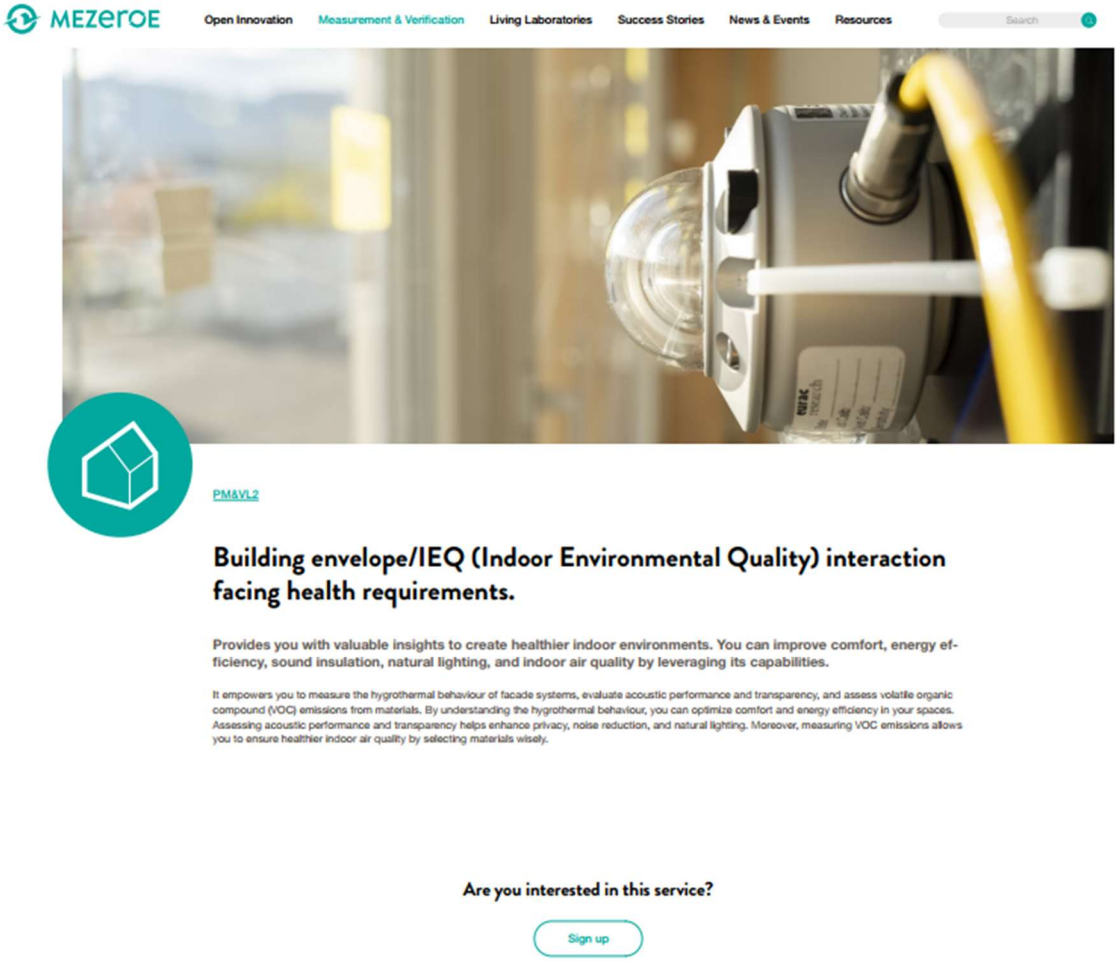


Figure 17: PMVL2 public information available in the Platform

This structured information has been used not only to populate the platform but also to support other project activities, such as the validation steps and the preparation of the Open Calls.

Thanks to the modular design of the information architecture, the descriptions of the PM&VLs can be updated and extended with the future project development, ensuring the long-term relevance and accuracy of the platform content.

5. Production of success stories in the provision and usage of the services

The production of success stories is an important step to demonstrate the concrete value of the MEZeroE services and to showcase how they can support innovation within the ecosystem. Success stories serve multiple purposes: they provide visibility to the results achieved, they illustrate practical use cases for potential users, and at the same time they help build trust in the services offered through the platform.

In this initial phase, the focus is placed on success stories related to the PM&VLs and OIS2, as these are the services that have been tested so far. At this stage, no concrete success stories have been collected for the other OISs, since their testing has been conducted only in virtual form (e.g. Idea Manager and related tools) or will be carried out in the framework of the recent Open Call.

To ensure consistency in reporting, dedicated templates have been developed for both PM&VLs and OISs (see Appendix 1). The following section describes the data collection process, based on the templates, which will enable the structured compilation and presentation of future success stories as the services are progressively validated and adopted.

A key achievement was the publication of success stories. The collaboration of all partners involved in the PM&VLs was crucial to achieving this result. The information gathering and publication process was conducted as follows.

The first step was to engage partners in sharing information about the tests conducted in the testing facilities. To simplify and speed up this process, two types of templates were designed: a detailed template, also useful for gathering information, and a more high-level template for defining the publication layout on the platform (see Appendix 1). The detailed template, as illustrated in Figure 18.a, allowed for the definition and collection of the following information about the tests:

- Title
- Description of the test conducted
- Product involved
- PM&VL involved
- Construction Segment
- Type of test
- Photos during the test execution
- Graphs and description of the test results

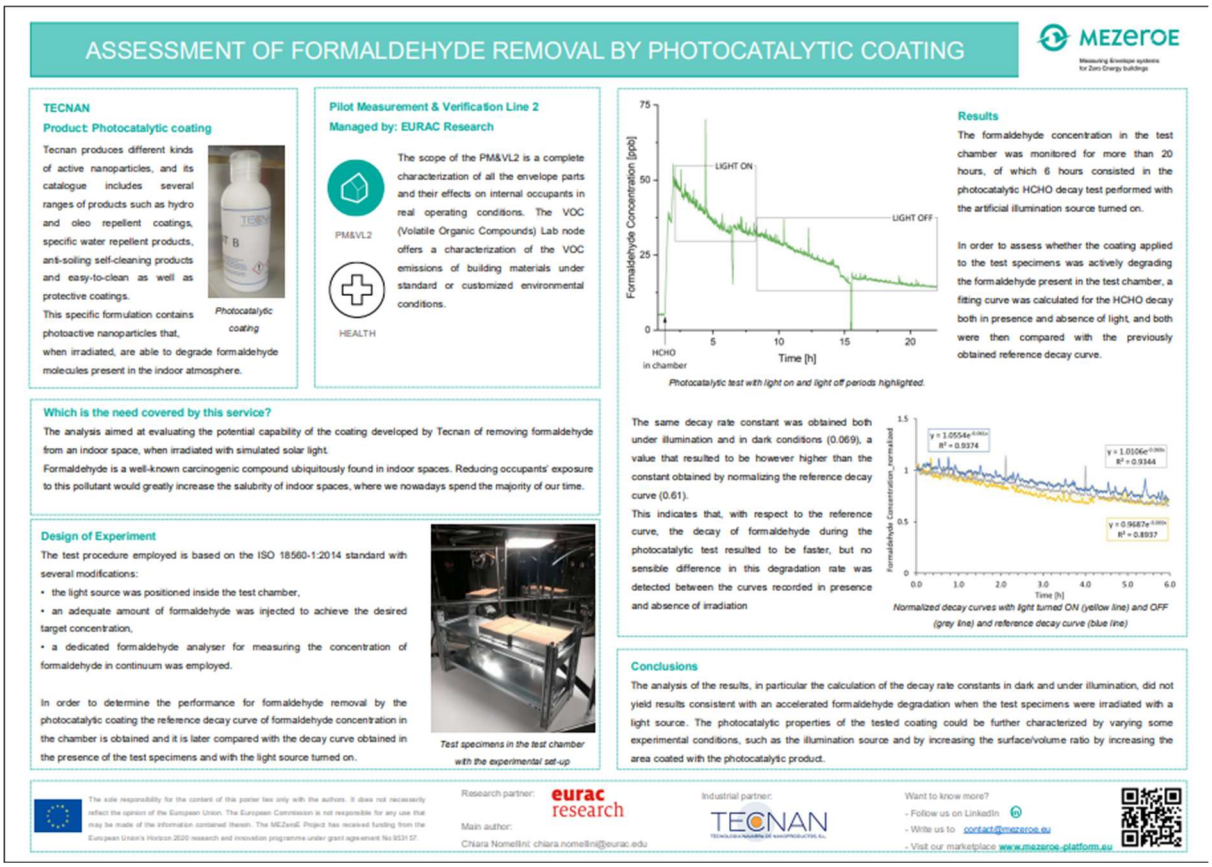


Figure 18.a: Success story detail information collection template

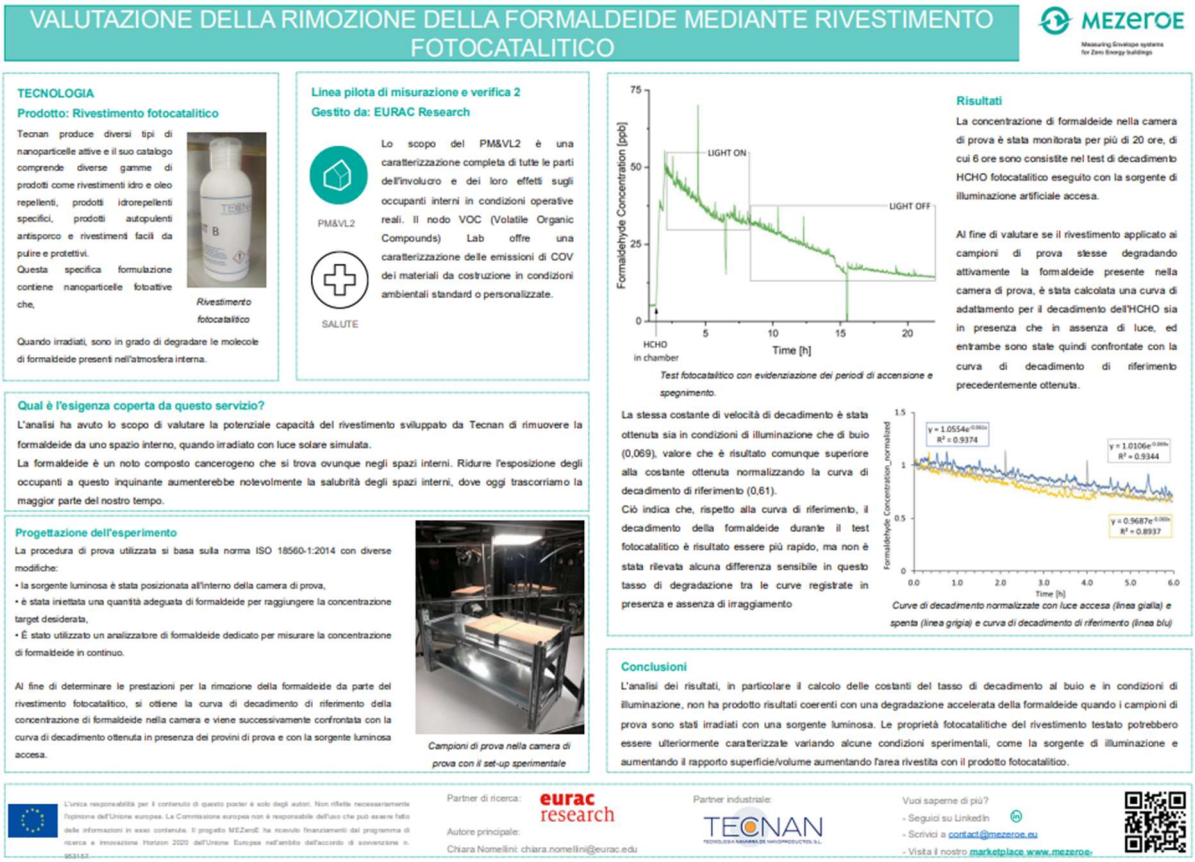


Figure 18.b: Success story detail information collection template in local language

The templates were discussed and validated during a workshop where MEZeroE partners were able to provide feedback and suggestions via a Miro board that previewed the previous detail template and the layout template available in the Appendix 1 of this document. At this stage, particular attention was paid to choosing a navigation flow that favors a gradual progression toward increasingly complex information. The high-level graphic template represents the first point of access to the success story. Here, there is a summary and simplified information; scrolling down the page allows you to explore more detailed information regarding the results. By clicking the link in the Download Info section, users can also download a detailed document containing additional information. This document reflects the format of the information collection template indicated above. The participation of the project partners was therefore crucial and particularly fruitful, providing valuable advice for improving the templates.
Following the validation of the templates, the data collection process was completed, and the publication phase began.

There are currently 17 PM&VL success stories on the platform. This phase is still ongoing, and more PM&VL success stories will be published soon. As shown in Figure 18.b the detailed templates have also been translated into the local language of the test line manager. These additional resources are currently being published and will soon be available for all published success stories. As shown in the first part of Figure 20, users can download them by clicking the appropriate local language link in the DETAIL INFO section of the success story.Figure 19 shows the current version of the Success Stories section (https://mezeroe-platform.eu/success-stories) which allows access to specific pages dedicated

to each success story. While Figure 20 shows the success story titled “Assessment of formaldehyde removal by photocatalytic coating”. These screenshots demonstrate how useful the template design and validation process was, providing the platform with a graphic layout and information content that was almost as good as designed in the template.

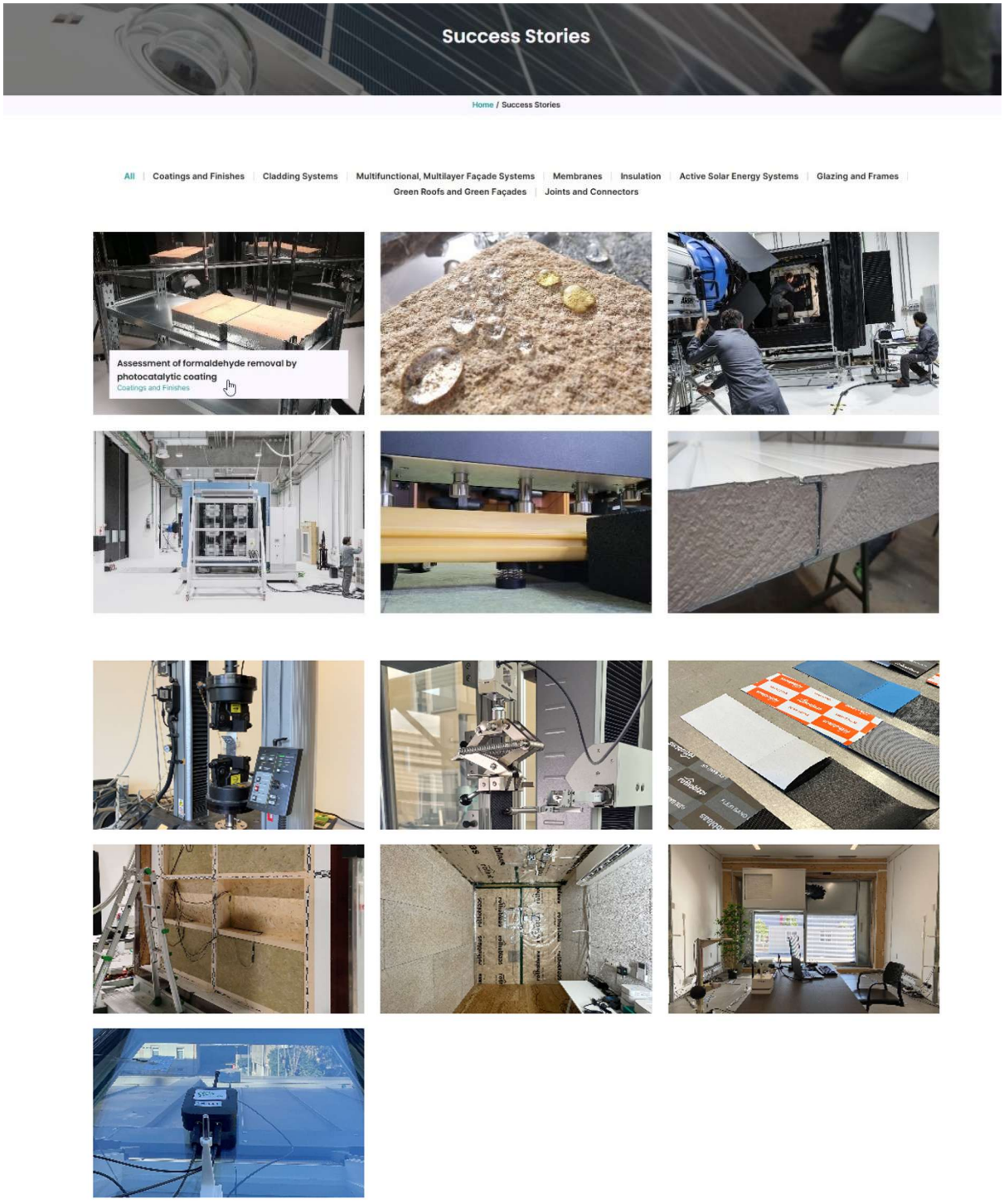
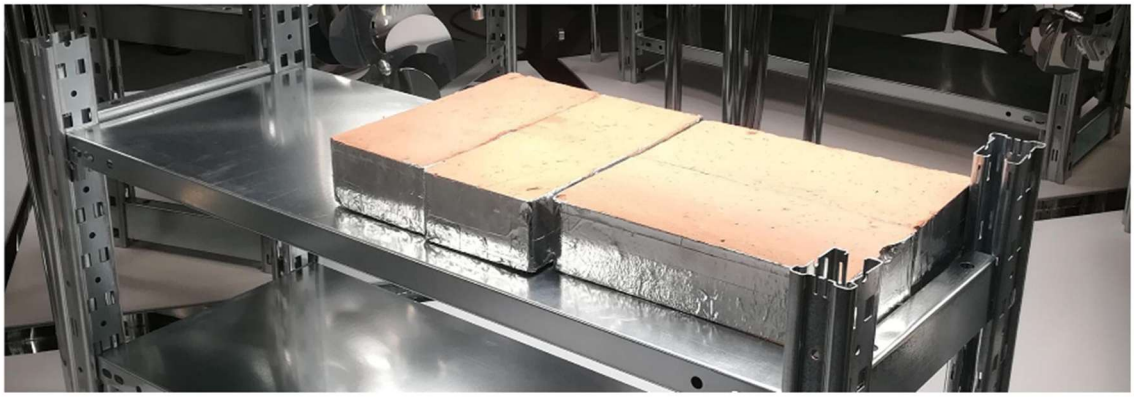


Figure 19: Current version of the Success Stories page

Assessment of formaldehyde removal by photocatalytic coating

Home / Success Stories / Assessment of formaldehyde removal by photocatalytic coating



MEASUREMENT & VERIFICATION (PM&VL 2)

Product: Photocatalytic coating

Tecnan produces different kinds of active nanoparticles, and its catalogue includes several ranges of products such as hydro and oleo repellent coatings, specific water repellent products, anti-soiling self-cleaning products and easy-to-clean as well as protective coatings. This specific formulation contains photoactive nanoparticles that, when irradiated, are able to degrade formaldehyde molecules present in the indoor atmosphere.

The scope of the PM&VL2 is a complete characterization of all the envelope parts and their effects on internal occupants in real operating conditions. The VOC (Volatile Organic Compounds) Lab node offers a characterization of the VOC emissions of building materials under standard or customized environmental conditions.

ABOUT

Health

PARTNERS

Scientific partner
EURAC Research

Industrial Partner
TECNAN

Main author:
Chiara Nomellini
EURAC Research

DETAILED INFO

Click here to download!
Clicca qui per scaricare!

The analysis aimed at evaluating the potential capability of the coating developed by Tecnan of removing formaldehyde from an indoor space, when irradiated with simulated solar light. Formaldehyde is a well-known carcinogenic compound ubiquitously found in indoor spaces. Reducing occupants' exposure to this pollutant would greatly increase the salubrity of indoor spaces, where we nowadays spend the majority of our time.

Design of Experiments

The test procedure employed is based on the ISO 18560-1:2014 standard with several modifications:

- the light source was positioned inside the test chamber,
- an adequate amount of formaldehyde was injected to achieve the desired target concentration,
- a dedicated formaldehyde analyser for measuring the concentration of formaldehyde in continuum was employed.

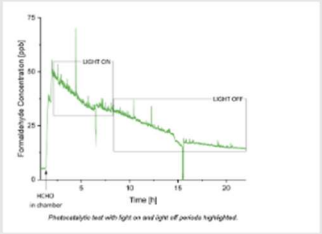
In order to determine the performance for formaldehyde removal by the photocatalytic coating the reference decay curve of formaldehyde concentration in the chamber is obtained and it is later compared with the decay curve obtained in the presence of the test specimens and with the light source turned on.

Test specimens in the test chamber with the experimental set-up

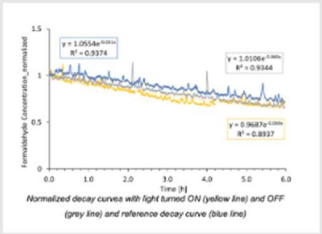
Results

The formaldehyde concentration in the test chamber was monitored for more than 20 hours, of which 6 hours consisted in the photocatalytic HCHO decay test performed with the artificial illumination source turned on.
In order to assess whether the coating applied to the test specimens was actively degrading the formaldehyde present in the test chamber, a fitting curve was calculated for the HCHO decay both in presence and absence of light, and both were then compared with the previously obtained reference decay curve.

The same decay rate constant was obtained both under illumination and in dark conditions (0.069), a value that resulted to be however higher than the constant obtained by normalizing the reference decay curve (0.61).
This indicates that, with respect to the reference curve, the decay of formaldehyde during the photocatalytic test resulted to be faster, but no sensible difference in this degradation rate was detected between the curves recorded in presence and absence of irradiation



Photocatalytic test with light on and light off periods highlighted.



Normalized decay curves with light turned ON (yellow line) and OFF (grey line) and reference decay curve (blue line)

Conclusion

The analysis of the results, in particular the calculation of the decay rate constants in dark and under illumination, did not yield results consistent with an accelerated formaldehyde degradation when the test specimens were irradiated with a light source. The photocatalytic properties of the tested coating could be further characterized by varying some experimental conditions, such as the illumination source and by increasing the surface/volume ratio by increasing the area coated with the photocatalytic product.

CONSTRUCTION SEGMENT	TEST CATEGORY	DATE	SHARE
Coatings and Finishes	Solar	30 July, 2023	

Figure 20: Detail page of a Success Story

6. Living Labs descriptions

Another important process and instruments for the collection and creation of information about MEZeroE service was the definition of the Living Labs' identity card. Generally, the term living lab indicates a test facility that is occupied by real people using the building as their home, office or other relevant type of building, but in the case of MEZeroE project, it refers to real-building living labs. Quoting the answer in the FAQ section they are: *A real building used as a living lab is a building in normal operation occupied by real people but equipped with sufficient embedded sensors to measure relevant parameters. Human participants are the usual users of the chosen buildings and are invited to provide feedback by means of questionnaires. Real-building living labs enable to evaluate technologies and solutions in operational environments going therefore beyond PM&VLs capabilities in terms of achievable TRL.*

After several iterations to identify the best way to publicize the potential and benefits of living labs, the decision was made to create living lab identity cards.

The data contained in the identity card are as follows:

- Detail Building information, such as:
  - Building type
  - Location
  - Year of construction
  - Number of occupants
  - Energy consumption
  - Product under study
- Reason for testing
- Description of the tested product
- Description of the building
- Description of the external climate
- Description of the internal climate
- Description of the renovation plan
- Information regarding the OIS2 monitoring plan
- Timeline and actions regarding the building

The process followed to achieve this result was similar to that used for the success stories. In this case, however, a single template (see Appendix 1) was created to define the publication layout on the platform. This template was also discussed and validated with the MEZeroE partners, using the same validation methods as the success story templates. Workshop participants were able to view, comment on, and validate the template preview via a Miro board.

Particularly important at this stage was the collaboration with project partners responsible of the set up and development of the Living Labs, which provided significant input in designing the identity cards and collecting the information and visual materials.

By the end of the project, the first living laboratory identity card will be published (see Annex 1). This will provide a detailed description of the Focchi office located in Poggio Torriana, Italy.

7. The MEZeroE BIM Package Configurator

. The activities described in this report acted as a bridge between two project areas, ensuring that the results from the work on BIM-based information flow management are made available on the MEZeroE platform. These activities involved structuring and collecting text, images and icons. In particular, the Open Innovation Service 3 includes this BIM-related service, consists of two different elements:

- the **BIM Readiness Level checkup** is a service that evaluates the Building Information Modeling (BIM) readiness level of a company and identifies a possible roadmap to increase it according to the available benchmarking of EU construction companies in the relative sector. The first phase consists of a survey available on the MEZeroE Platform, after the elaborations of the replies, a digital report will be generated and sent to the client.

- the **Envelope package BIM configurator** is a tool that offers building envelope systems and products manufacturers the minimum digitalized information dataset according to the respective construction segment and four different use scenarios. From the tool section in the private part of the MEZeroE Platform, the client can visualize and download the list of parameters necessary to create the BIM object of the product selected.

The nature of the services is quite technical, therefore it has been necessary to work on the way they are presented in the platform, and on the interaction and exchanges of information between the end users and the MEZeroE platform, with the objectives of making the interface as intuitive as possible and the interaction fluid.

An initial discussion took place to decide where to locate these two subservices on the platform. Both are visible and promoted in the public area of the MEZeroE platform, as part of the OIS3, and are accessible only from the private area: the first one in the services sections, while the second one in the tools section. Both titles and descriptions of the services for the platform have been changed over time, as shown in Figure 21, with the progress of the project and to be compliant with the common language previously defined.

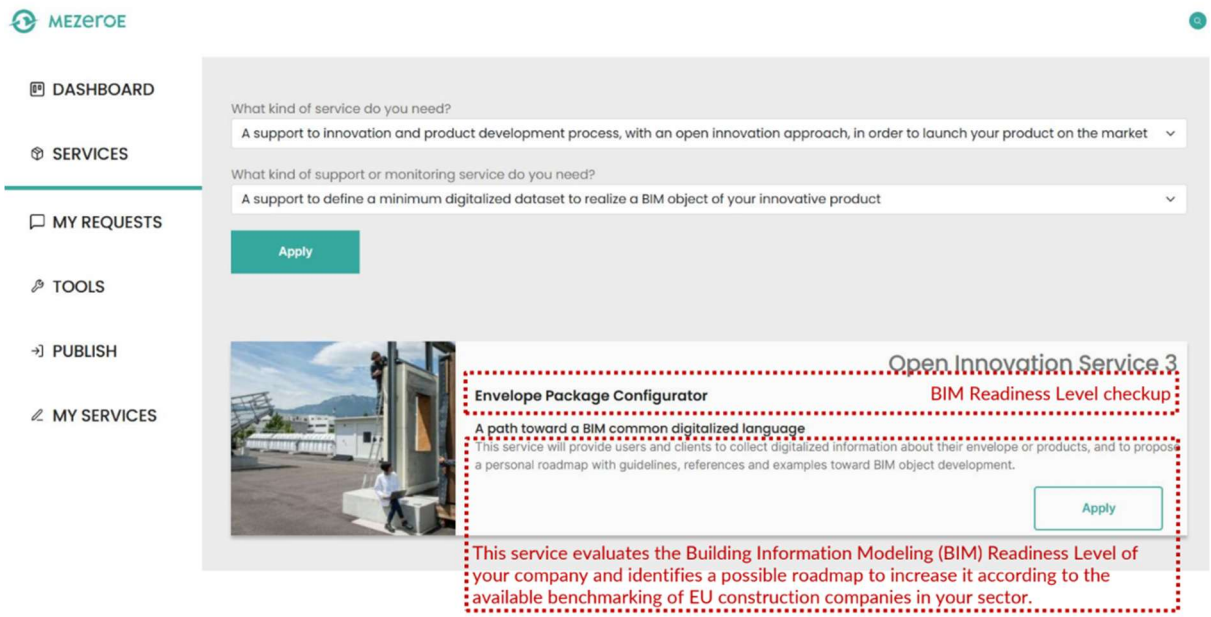


Figure 21: proposed changes to the interface of the BIM readiness level checkup

Subsequently, several rounds of discussion were held to define the optimal method for implementing the subservices into the Platform. In this instance, the two subservices are integrated in the private part of the platform via distinct approaches, tailored to their individual characteristics. Regarding the BIM Readiness Level check-up, the initial proposal was of integrating a questionnaire and a dashboard to display the results into the platform. This proposal stemmed from the idea of enhancing the platform by expanding its functionality. However, these two options were set aside due to their technical implementation overhead. Therefore, it was decided to integrate the service into the already developed workflow: users can find and select the service in the Services section of their private area and send a request to the related MEZeroE partner. Following the request, an exchange of information begins between the two parties, potentially leading to the sharing of questionnaires, reports, and assessments (see Sect 3 of this document for more information).

Regarding the Envelope package BIM configurator, it was decided from the early design stages to include it in the tools section of the private section of the platform. The tool's main page offers two drop-down menus for selecting the application scenario and the relevant construction segment. Once the selection is complete, a table containing the parameters needed to create a BIM object is displayed on the same page. The user also has the option of downloading the list of parameters in CSV format using the dedicated download function. To make this tool more intuitive and immediate, has been decided to integrate:

- a set of icons (infographic) dedicated to scenarios and construction segments
- a static dashboard to accompany the list of parameters

Figures 22, 23 and 24 show the proposals:

The MEZeroE Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 953157

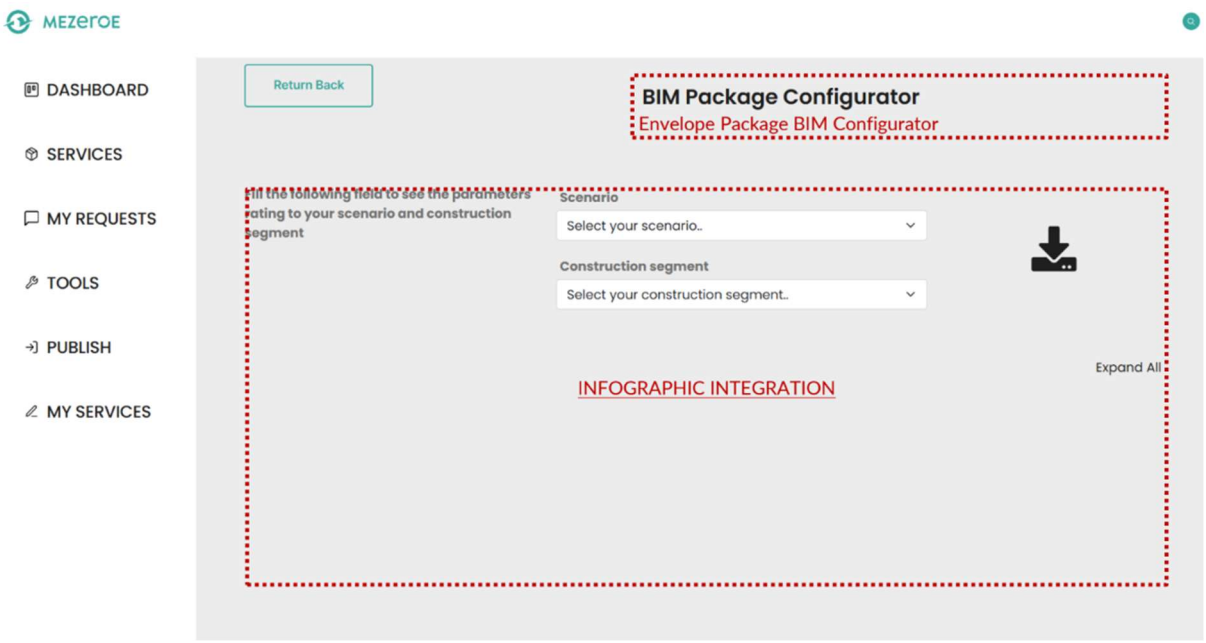


Figure 221: Initial interface of the BIM configurator

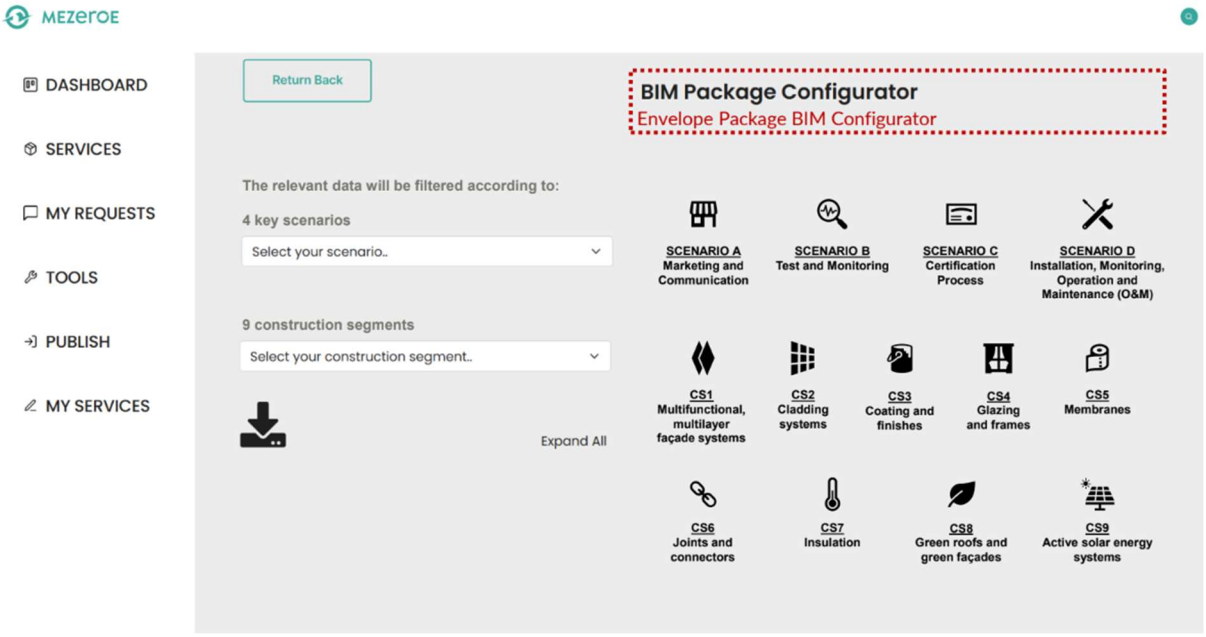


Figure 23: Integration of infographics to make more intuitive the interaction with the BIM configurator

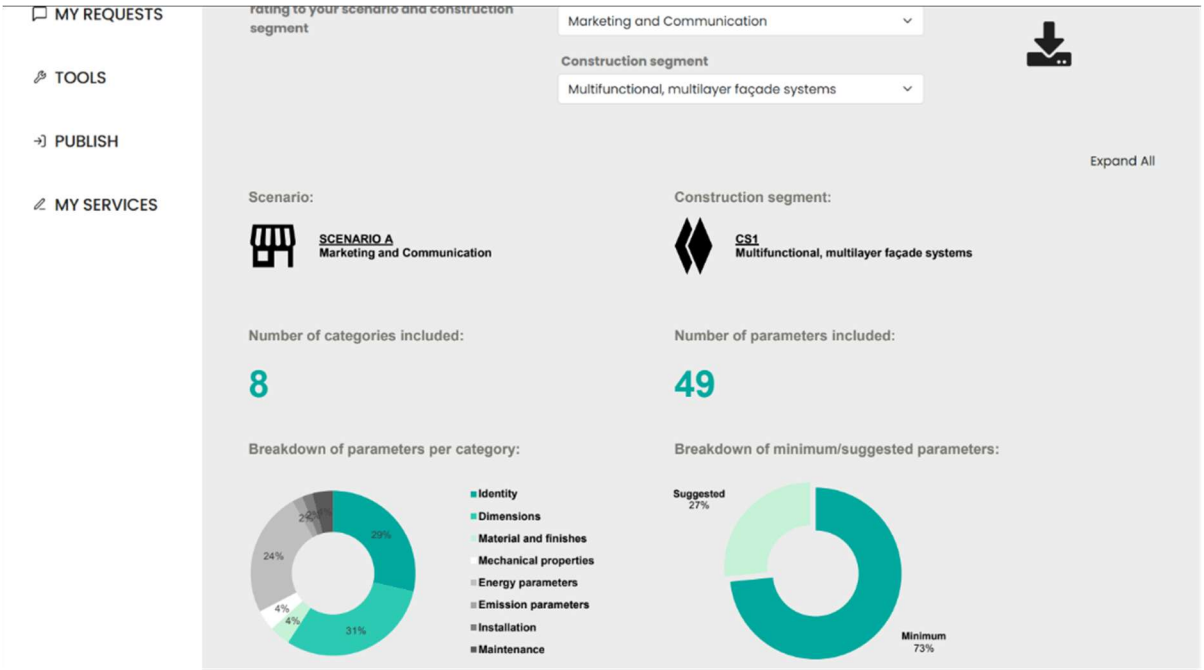


Figure 242: Enveloper package BIM configurator static dashboard

At the time of writing, the only planned activity that will be completed by the end of the project is the implementation of the iconography shown in Figure 23. The static dashboard (see Figure 24) insertion activity has been put on hold to prioritize other tasks.

8. Conclusions

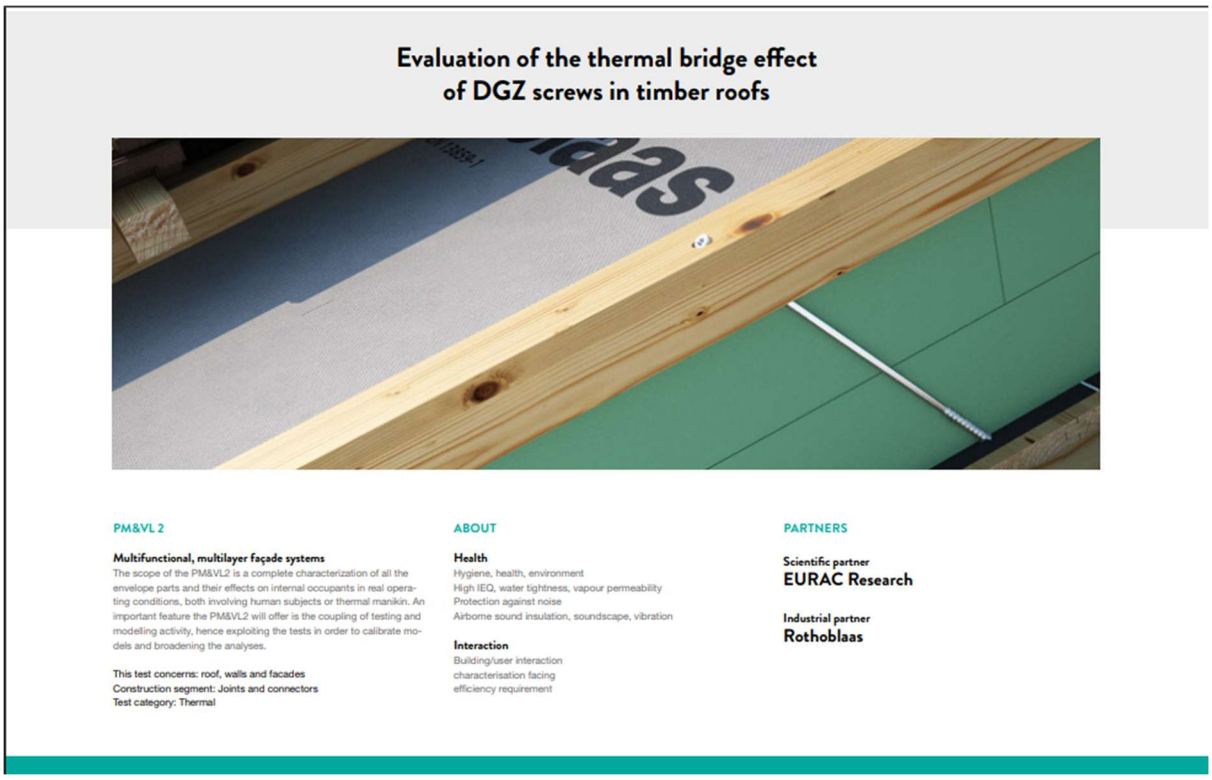
Task 2.5 has played a central role in bridging the technical knowledge and outcomes generated within the MEZeroE porject with the digital platform. By defining a common language, structuring the information on Open Innovation Services (OISs), Pilot Measurement & Verification Lines (PM&VLs), Success Stories, and Living Labs and ensuring their clear presentation in both public and private areas of the platform, the task has contributed to making the MEZeroE ecosystem more accessible and valuable to its stakeholders. The activities carried out in this task have ensured that the services developed within the project are not only technically sound, but also understandable and usable by a broad community of users, including SMEs, industry players and buildings professionals.

Templates and methodologies for the collection of data, the characterisation of services, and the first steps in producing success stories provide a structured foundation that can be further enriched as the MEZeroE project advances and also after its lifetime. The work initiated with the language approach and structure of information is continuing though the development, population, and maintenance of the digital platform, that will proceed until the end of the project. The modularity of the information structures also allows the MEZeroE platform to be extended beyond the project's lifetime, ideally ensuring its long-term relevance and sustainability.

A. Appendixes – Visual Templates

This section collects the templates developed and subsequently validated by the project partners.

a. PM&VL Success Stories



Evaluation of the thermal bridge effect of DGZ screws in timber roofs

PM&VL 2

Multifunctional, multilayer façade systems
The scope of the PM&VL2 is a complete characterization of all the envelope parts and their effects on internal occupants in real operating conditions, both involving human subjects or thermal manikin. An important feature the PM&VL2 will offer is the coupling of testing and modelling activity, hence exploiting the tests in order to calibrate models and broadening the analyses.

This test concerns: roof, walls and facades
Construction segment: Joints and connectors
Test category: Thermal

ABOUT

Health
Hygiene, health, environment
High IEQ, water tightness, vapour permeability
Protection against noise
Airborne sound insulation, soundscape, vibration

Interaction
Building/user interaction
characterisation facing
efficiency requirement

PARTNERS

Scientific partner
EURAC Research

Industrial partner
Rothoblaas

The analysis aims to evaluate the thermal performance of the DGZ screws when compared to traditional screws in the context of an insulated timber roof. The test was performed on the DGZ wood screws, an innovative type of screw with double thread that allows continuous, uninterrupted fastening of the roof insulation package, preventing limiting the thermal bridges in accordance with energy saving regulation effect.

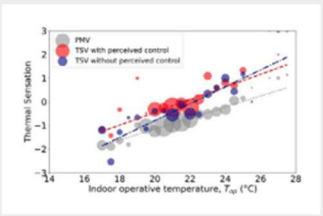
Design of Experiments

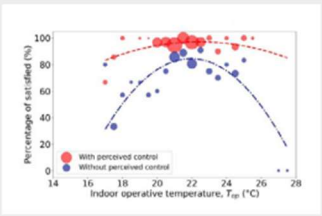
Innovative procedure
Thermal simulations at component level are carried out in accordance with the standard UNI EN ISO 10211:2018 with the software "Mold 3D 5 Dynamic"

Accredited test
Thermal simulations at component level are carried out in accordance with the standard UNI EN ISO 10211:2018 with the software "Mold 3D 5 Dynamic"

Results

1. The difference between the two screws is more visible for the cases with timber beams that for the cases with CLT
2. Increasing the thickness of insulation, the difference in the ΔU decreases
3. The thermal bridge effect using the DGZ screws is always smaller and the reduction of the U-value of the roof using the DGZ screws, ΔU_(DGZ-traditional), ranges from 0.014 W/(m^2 K) to 0.033 W/(m^2 K)
4. The estimation of the additional thickness of insulation required to compensate for the increased U value in the case of traditional screws compared to the DGZ screws , Δt_(DGZ-traditional), ranges from 1.1 cm to 3.0 cm.





Open Innovation Outcomes

The research activity has been performed just between Eurac Research and Rothoblaas. Results will be shared on Rothoblaas catalogue but mainly with a marketing scope, without specifically aiming to an open innovation approach.

Conclusion

Calculations have shown an advantage in using DGZ screws instead of traditional timber batten screws because the insulation is not interrupted. This advantage, in terms of thermal transmittance (U-value), is seen more for structures with wooden beams than for XLAM. In addition, the advantage is greater for fewer centimetres of insulation, again in terms of thermal transmittance of the whole package. The U-value advantage is also greater for higher-performance insulation (lower thermal conductivity). However, all these arguments are made in terms of differences in thermal transmittances, but if differences in thermal resistances are taken, things may be different.

b. OIS Success Stories

The MEZeroE Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 953157


OPEN INNOVATION
Innovative Products: CE Marking Success Story
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hat might interest you
link to other story
SUBSERVICE DESCRIPTION
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ABOUT
Health
Hygiene, health, environment
High IEQ, water tightness, vapour permeability
Protection against noise
Airborne sound insulation, soundscape, vibration
Interaction
Building/user interaction
characterisation facing
efficiency requirement
ENTITIES / ACTORS INVOLVED
Catchy message / Summarized topic
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Goal / Expected benefits

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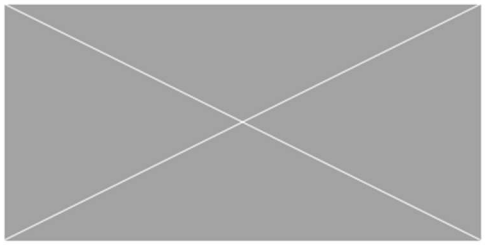

Actions / Scope

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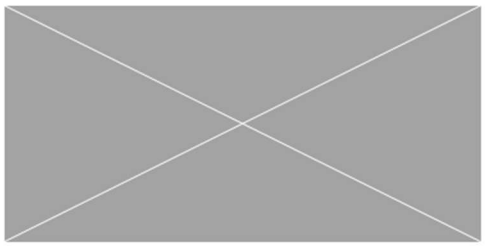

Graphics / Plan / Image

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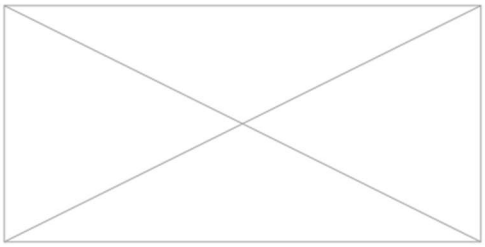

Results / Outcomes

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Conclusion

Calculations have shown an advantage in using DGZ screws instead of traditional timber batten screws because the insulation is not interrupted. This advantage, in terms of thermal transmittance (U-value), is seen more for structures with wooden beams than for XLAM. In addition, the advantage is greater for fewer centimetres of insulation, again in terms of thermal transmittance of the whole package. The U-value advantage is also greater for higher-performance insulation (lower thermal conductivity). However, all these arguments are made in terms of differences in thermal transmittances, but if differences in thermal resistances are taken, things may be different.

Contact us

c. Living Laboratory Identity Card

Log in FAQ Glossary

MEZeroE Open Innovation Measurement & Verification Living Laboratories Success Stories News & Events

LIVING LAB N°1

Focchi Office building, Italy

IDENTITY CARD

Building type:	**Office building**
Location:	**Poggio Torriana, Italy**
Year of construction:	**2008**
Number of occupants:	**121**
Energy consumption:	**203 kWh/m²/year**
Products interested in:	**Focchi's facade**
	Window Master's ventilaton
Products confirmed:	**Focchi's facade**
Quantity:	**450 m²**

MOTIVATION FOR PRODUCT TESTING

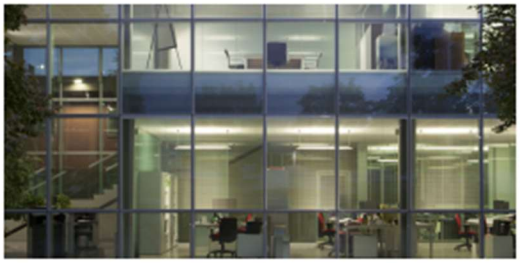
Assessment of prefabricated multifunctional facade on indoor environmental quality for working spaces, analysis with the results measured within PM&VL2 and PM&VL5.

Product description

Prefabricated multifunctional facade is designed and developed for integrating different services for supporting facility management in achieving nZEB balance and ensuring multi-comfort for the occupants. Multi-comfort is addressed by simultaneously achieving thermal, visual and acoustic comfort together with a sufficient level of indoor air quality. The prefabricated multifunctional facade integrates heating/cooling heat pump, heat recovery and ventilation systems embeded in the envelope. The apertures included in the facade are equipped with actuators for automatic opening and closing and with shading blinds integrated in the glazing unit. Sensors are installed in the prefabricated facade, communicating with a gateway for the control of the facade operationsin order to reach the optimal operation and configuration of the facade.

Building description

2-story building with a 937 m2 sandwich panel roof, 1300 m2 stick system with TGU facade, fully glazed doors and 370 m2 curtain wall facade with 1 vent each 2 facade module. In 2016 the building underwent a series of interventions to create an integrated facade-plants-BMS solution, thus making Focchi headquarters a living lab for the study and prototyping of integrated solutions.



Climate

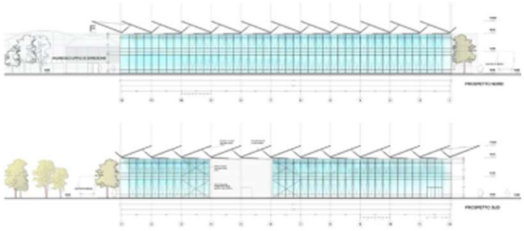
Hot and wet summers, winters are moderately cold. The precipitation is high and there is no dry season. Average temperatures are around 1 °C to 3 °C in January, and more than 22 °C in July and August.

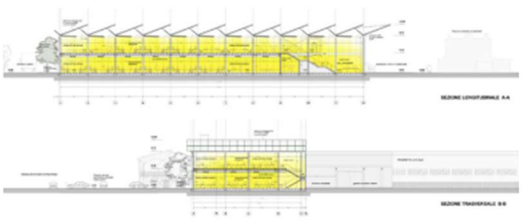
Internal climate

Risk of overheating in summer and also in winter. Indoor microclimate is maintained by air conditioners and windows that are managed locally by employees.

Renovation plan

Office building (Focchi HQ) will be renovated by increasing the covered floor area of around 300 m2. Replacement of the facade in the areas affected by the intervention. Installation of prefabricated multifunctinal facade will follow.





Monitoring plan (OIS2)

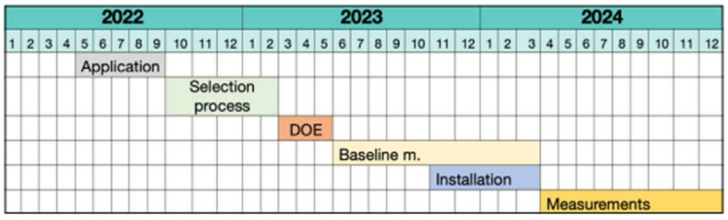
Thermal comfort parameters:	Indoor air temperature, relative humudity
IAQ study:	CO2, PM2.5, PM10, formaldehyde, TVOC
Acoustic study:	Sound pressure level
Post-occupancy evaluation:	Basic "one-off questionnaire" on the user-satisfaction with the overall indoor environmental quality

Timeline

Office building (Focchi HQ) will be renovated by increasing the covered floor area of around 300 m2. Replacement of the facade in the areas affected by the intervention. Installation of prefabricated multifunctinal facade will follow.

Actions

Baseline measurements started in May 2023 (ongoing)
Product installation started in December 2023 (ongoing)



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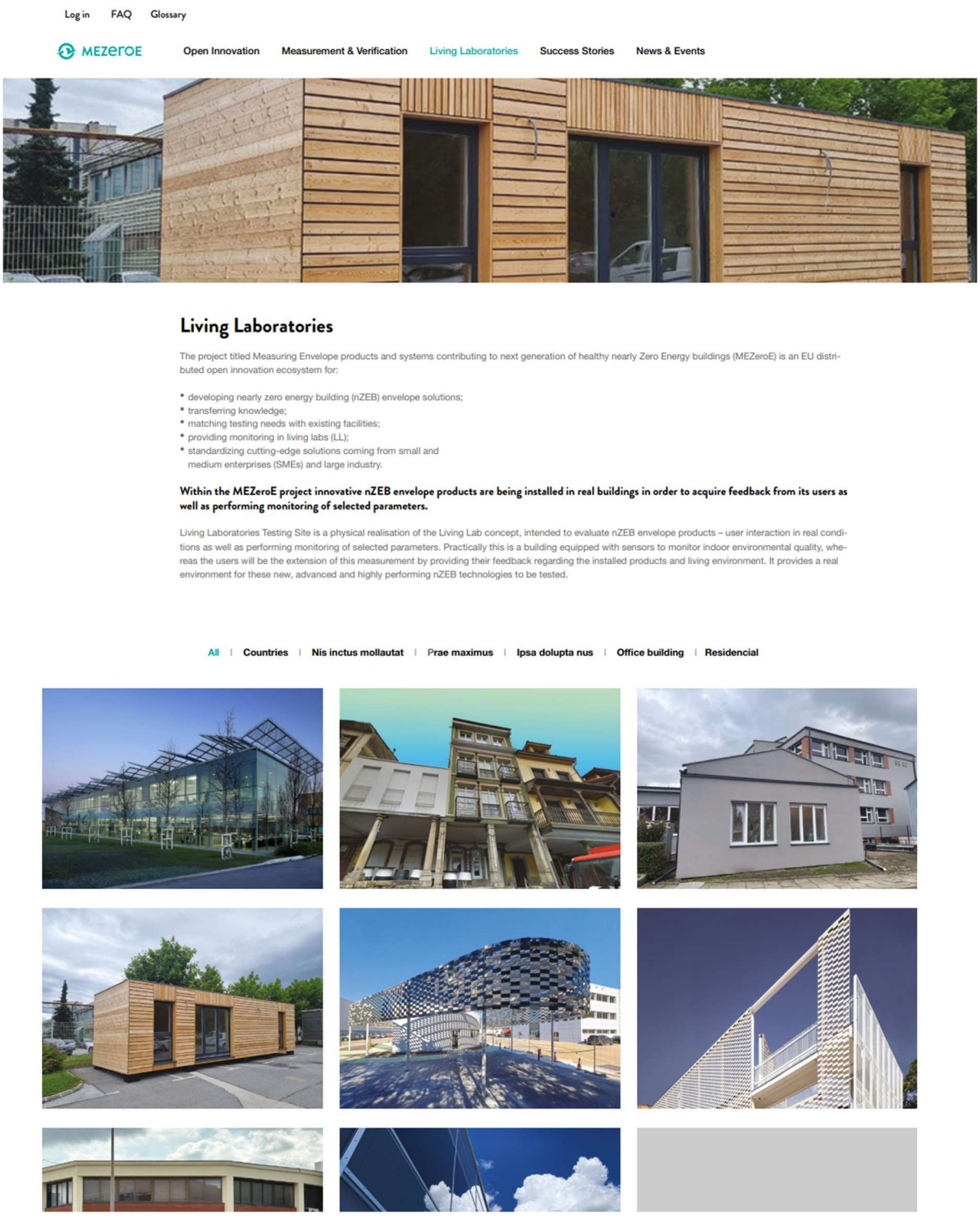
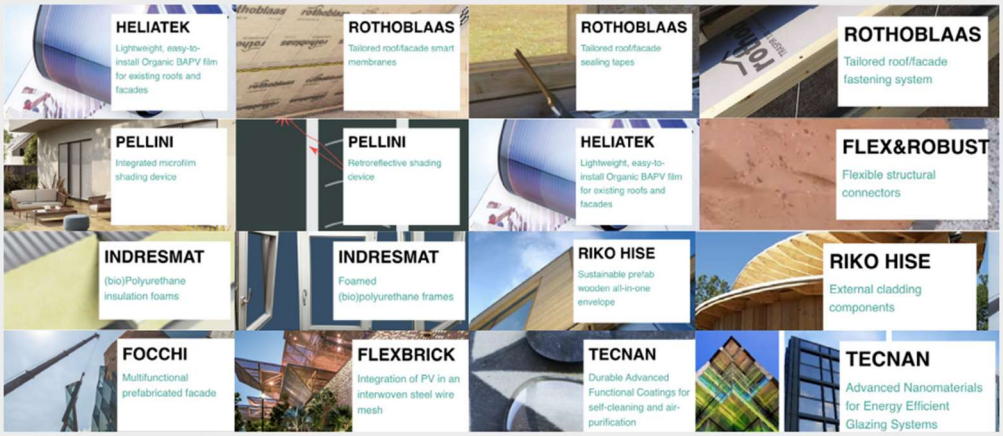
d. Living Laboratory Section



Installed technologies



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