



# **D4.4 BUS-GoCircular Training Packs**

## **Report**

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# D4.4 BUS-GoCircular Training Packs

## Report

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## List of acronyms and abbreviations

**BIM:** Building Information Model / Management

**BGC:** BUS-GoCircular project

**BUS:** Build Up Skills

**CDW:** Construction and Demolition Waste

**EQF:** European Qualification Framework

**EoSL:** End of Service Life

**EPD:** Environmental Product Declarations

**EU:** European Union

**FTP:** Fundamental Training Pack

**FUNDAE:** State Foundation for Employment Training

**HVAC:** Heating, ventilation, and air conditioning

**LCA:** Life Cycle Assessment

**SME:** Small and medium-sized enterprises

**TP:** Training Pack

**ULO:** Unit of Learning Outcomes

**RES:** Renewable Energy Source

## Definitions

**Circular economy:** The circular economy offers the next progressive step in our economic model, taking over from the current linear ‘take-make-waste’ economy by seeking to extract the maximum value from resources in use and keep materials in circulation for as long as possible through processes like reuse, repair, remanufacture and recycling. The ultimate goal of a circular economy is to establish an ecologically safe and socially just operating space for humankind.

**Key elements framework:** The Key Elements (KE) framework is a conceptual framework of eight elements of circularity that can be applied at different intervention levels (for example, national, regional, sector, business, product, process, or material) towards a circular economy. The KE framework consists of three core elements and five enabling elements. Core elements deal with physical flows directly, whilst enabling elements deal with creating the conditions or removing barriers, for a circular transition.

**Competencies:** describe the desired knowledge, skills and behaviours a training may aim to build, whereas learning outcomes describe what a learner will be able to do in some measurable way. Competencies, Skills and Knowledge are assigned to Units of Learning Outcomes (ULOs) in Circular Construction Skills Qualification Framework (T3.2).

**European Qualifications Framework (EQF):** is a translation tool to make national qualifications easier to understand and more comparable. The EQF seeks to support cross-border mobility of learners and workers, promote lifelong learning and professional development across Europe. The EQF is an 8-level, learning outcomes-based framework for all types of qualifications that serves as a translation tool between different national qualifications frameworks.

**Skills:** Ability to apply knowledge and use know-how to complete tasks and solve problems.

- **Current Skills:** The skills level at which professionals and experts see their current level of skill.
- **Future Skills:** The skills level at which professionals and experts see their future level of skill.
- **Skills Gap:** The gap which exists between the current and future skills levels.

## The eight key elements of circularity are:

### Core key elements:

1. **Prioritise regenerative resources:** Ensuring that renewable, reusable, non-toxic resources are used in the manufacturing of built environment. Ensuring that all resources are used in an efficient way.
2. **Preserve and extend what is already made / Stretch the lifetime:** While resources are in-use, maintain, repair and upgrade them to maximise their lifetime and give them a second life through take back strategies when applicable.
3. **Use waste as a resource:** Utilise waste streams as a source of secondary resources and recover waste for reuse and recycling.

### Enabling key elements:

4. **Design for the future:** Account for the systems perspective during the design process, to use the right materials, to design for appropriate lifetime and to design for extended future use.
5. **Collaborate to create joint value:** Work together throughout the supply chain, internally within organisations and with the public sector to increase transparency and create joint value.
6. **Rethink the business model:** Consider opportunities to create greater value and align incentives that build on the interaction between products and services.
7. **Incorporate digital technology:** Track and optimise resource use and strengthen connections between supply chain actors through digital, online platforms and technologies that provide insights.
8. **Strengthen and advance knowledge:** Develop research, structure knowledge, encourage innovation networks and disseminate findings with integrity.

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# 1. Introduction

This document aims to outline the necessary contents, methodologies, timelines, and evaluation criteria essential for attaining a foundational understanding of circularity in construction. It is tailored to align with the profiles of workers within small and medium-sized enterprises (SMEs).

As part of the BUS-GoCircular (BGC) project, eight Training Packs (TP) have been developed, one at EU level in English, and seven more in the participating countries (Bulgaria, Croatia, Czech Republic, Hungary, Ireland, Netherlands and Spain) using their respective languages and adapted to the national context of each country. The modules developed have been chosen within the training plans proposed in the report “D3.4 BUS-GoCircular Fundamental Training Packs”. Therefore, each country has created its Training Pack adapted to national needs. However, all packs include a common initial module on the 8 key elements of circular economy.

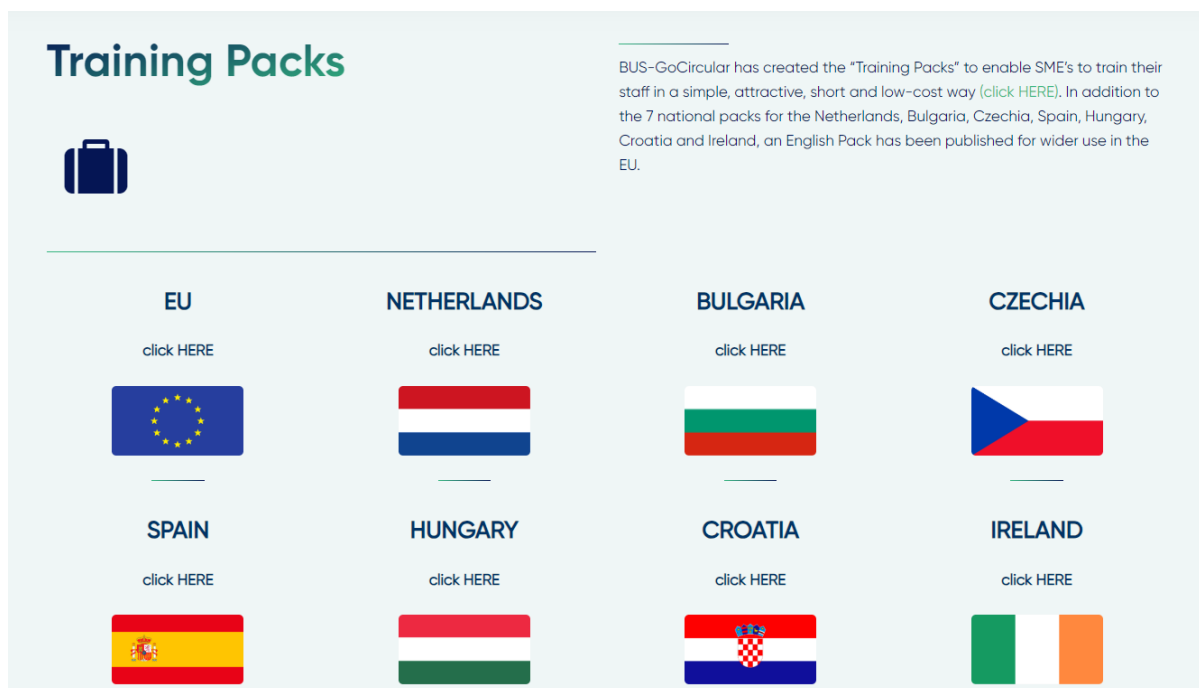


Fig. 1: Screenshot of the BUS-GoCircular website where the Training Packs are available

The BUS-GoCircular Training Packs are developed for unskilled or low-skilled workers who are often faced with the design or installation of systems within the circular economy, whether required in certain European regulations or by customers themselves. This fact, besides the possibility of causing errors in its application, prevents these professionals from having a complete vision and from being



able to advise the client and give their opinion or innovation concerning the circular economy, restricting the sector from moving forward.

The strength of trained SMEs and their collaboration is needed to make the integration of the circular economy into the sector a reality. Moreover, with this new necessary knowledge, the SMEs themselves could create new professional profiles or SMEs required for increasing circular construction knowledge. Some of the materials can also be used with a semi-qualified workforce who require refresher training, or training in critical areas where knowledge has increased.

The Training Packs respond to a critical gap in the lack of a holistic training framework and open-source circular construction training materials that provide coverage of the basic knowledge, competencies and skills required by the circular construction workforce, where training is often limited to certain professional profiles in higher education (universities, masters), high-priced courses, specific single-topic courses or are simply, non-existent. The designed packs can be used to prepare unskilled workers but are also flexible enough to adapt and use selected modules according to the contextual needs of companies.

The aim is to promote a harmonised and standardised approach to SME training delivery, for many companies within the construction sector, seeking long-term availability of training created and tailored at the national level (in the national language) and also for internationally renowned organisations within the EU level (English).

## 2. Objectives and scope

The main objectives for BUS-GoCircular Training Packs are:

- Develop attractive and free or low-cost training programmes /methodologies on circular economy in construction for companies and relate them to open-source materials to upskill the workers.
- Identify missing open-source materials and address these gaps by creating new ones.
- Detect the companies that can be targeted and how that influences the different contents.
- Develop a content index based on the existing gap concerning the circular economy in the construction sector.
- Provide free materials on a digital platform.

## 3. Structure

All Training Packs are based on modules and include a common introductory module that is mandatory. Through this module, the learner will gain an understanding of what the Circular Economy is in a general sense and what the benefits and barriers are of implementing this today. They will explore the current situation within Europe and internationally about the Circular Economy and further explore how this relates to the construction industry.

This introductory module is divided into two parts:

- **Introduction to Circular Economy**: the learner will explore the principles of circularity in construction and learn from real-life case studies that emphasise the importance of circular materials in achieving sustainability in building projects. [Access the module HERE](#).

- **Main Strategies in Circularity**: related to materials & waste, water management, energy management, BIM-based projects. The student will also learn how to overcome barriers in building materials reuse, the benefits of reusing materials in construction, discover warehouses and markets that sell used materials and see inspiring case studies. [Access the module HERE](#).

In addition to this first mandatory introductory module, each country has developed one or more modules according to their respective needs to implement circularity in the construction sector.

## 4. Content of the Training Packs

As part of the BUS-GoCircular (BGC) project, eight Training Packs have been developed, one at EU level in English, and seven more in the participating countries (Bulgaria, Croatia, Czech Republic, Hungary, Ireland, Netherlands and Spain) using their respective languages and adapted to the national context of each country. All the Training Packs are published and available on the BUS-GoCircular project website at this link: <https://busgocircular.eu/training/>

### 4.1 The Training Pack of Bulgaria

In addition to translating the compulsory introductory module, the Bulgarian partner, EnEffect, has elaborated two further modules with a primary focus on the **management, availability and selection of resources**, specifically sustainable building materials and products for construction.

The intended audience for this Pack is small and medium-sized construction enterprises, which represent the biggest part of the construction force and hold the largest potential for impact nationally.



Fig. 2: Screenshot of Bulgaria Training Pack

The training pack contains interactive materials, videos and case studies. It has been conceived through active communication with professional associations for construction with natural and low-carbon materials and revolves around the three key elements of the circular economy. The content of the modules developed in Bulgaria is detailed below:

**Module “Sustainable construction materials and products”:** it explains the concept of embodied carbon and energy with relation to use of building materials and products and discusses circularity in terms of relevant labels and certificates which contribute to sustainable construction. It provides insight into the process of life cycle assessment to increase understanding of the environmental and health impacts construction causes. It aims to upgrade existing knowledge and practice with essential information on selection and handling of renewable and non-toxic products on the building site while reducing damage and waste and increasing durability.

The module includes knowledge from the BUS-GoCircular developed materials: [M3 Bio-based](#), [M5 Water](#) and [M6 Energy](#). The module also includes examples from Bulgaria and locally sourced knowledge and expertise into the topic as well as points to relevant national documents in support.

**Module “Zero waste construction with natural materials”:** it focuses mainly on practical examples to avoid creation of waste on building sites, during construction and demolition. It offers better understanding of local and national regulations regarding CDW management and reuse of recycled building materials. It also suggests that maintenance and repair are suitable methods for supporting circular models of extending the life cycle of buildings and products and thus contributing to lower impact from CDW. Examples were given with locally conceived projects with wooden and hemp products. For the creation of the module, content was used from [M8 Material Impact](#), [M9 Waste](#) and [M10 Deconstruction](#).

## 4.2 The Training Pack of Croatia

The Croatian training pack encompasses a comprehensive array of topics aimed at fostering sustainable practices within the construction industry. With a focus on circularity and resource efficiency, the pack provides valuable insights and practical guidance to professionals and SMEs seeking to incorporate sustainable principles into their projects.

In Croatia, the partner UZ-FCE has developed a **module that explores tools to support circular design in materials**. It includes four case studies and features six videos, one link to a free calculation tool, and seven links to external content for additional information. Together with the compulsory introductory module, the Pack is addressed to architectural and engineering offices and the validation process was conducted via survey providing valuable insights into client interests regarding topics, duration, and modality.

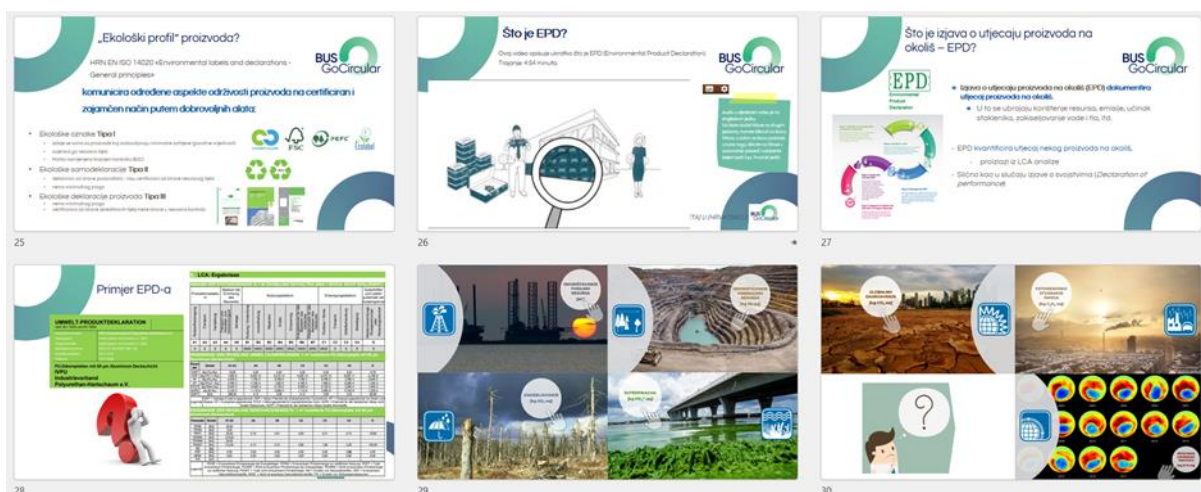


Fig. 3: Part of the content of the Croatian Training Pack

The training pack begins by emphasising the importance of prioritising regenerative and efficient use of resources, encouraging participants to rethink traditional approaches to resource management. It underscores the significance of utilising secondary resources and designing for the future, highlighting the benefits of stretching the lifetime of materials and adopting innovative business models.

Central to the pack's ethos is the concept of circularity. Participants (SMEs) delve into circular construction strategies, examining case studies of circular materials and learning how to read environmental product declarations (EPDs) to assess the circularity of materials. They also gain insights into material circularity indicators and the use of material passports.

The pack further explores green building certification systems, providing a comprehensive overview of standards such as LEED, BREAM, and DGNB. Participants learn how to align their projects with these standards, with a particular focus on materials credits and objectives.

Throughout the training, participants engage in hands-on learning experiences, including site visits and gamification activities. These immersive experiences enhance understanding and reinforce key concepts, such as passive design strategies for different climates.

One of the pack's unique features is its emphasis on digital technology, which is increasingly shaping the future of sustainable construction. Participants explore software tools for energy-efficient design and digitization, enabling them to leverage technology for more efficient and sustainable outcomes.

The training pack also addresses the importance of energy management in both public and private buildings. Participants gain practical insights into energy-efficient design strategies, including multifunctional green roofs and facades, as well as PV systems.

In summary, the Croatian training pack offers a holistic approach to sustainability in construction, equipping participants (SMEs) with the knowledge and skills needed to implement circular principles effectively. By combining theoretical learning with practical case studies and hands-on experiences, the pack empowers professionals (SMEs) to drive positive change and create more sustainable built environments.

## 4.3 The Training Pack of Czechia

In Czechia, the partner INCIEN developed two modules, which primarily address **biological materials, provide an outlook on material circularity, and explore the tools to support circular design in materials** in construction. The target audience for these modules includes manufacturers, educational

institutions, and non-governmental organisations. The pack boasts approximately 10 case studies and incorporates multimedia elements such as videos. Validation is done by individual interviews with stakeholders, primarily SMEs who could incorporate the training packs in their internal educational processes and up-skilling of professionals.

**Module “Strategies of circular design in materials”:** it includes main strategies related with materials in circular construction, exploring modularity and prefabrication, existing biological materials and techniques such as clay, wood, straw, wool, hemp and stone, and new biological materials and techniques, such as bioplastics, mycelium, biochar, bio-based concretes and cements and 3D printing. The module is supported by czech-language videos and many case studies from the Czech Republic, with a focus on local manufacturing.

**Module “Tools to support circular design in materials”:** it explains Environmental Product Declaration and its Product Category Rules, highlights the benefits of BIM modelling and digitalization, and briefly explores the topic of material passports.

## 4.4 The Training Pack of Hungary

The Hungary partner, EMI, has made significant contributions with the development of two modules: "Build to Close the Loop of Materials" that covers topics related to biological materials and the outlook on material circularity and "Digitisation" which explores BIM modelling for repair information, maintenance sheets, and materials passports.

The target audience for these modules includes blue-collar workers, SME workers, and university students. The modules feature videos, interactive workshops, and were validated through surveys.

**Module "Build to Close the Loop of Materials":** it briefly introduces the circularity approach and discusses in detail the different possibilities of building in wood, recycled concrete, green roofs, and bio-insulation systems. The module mentions cross laminated timber manufacturing, details the national standards and directives and features short videos for visual demonstration.

ÉMI is an expert on recycled concrete and developed the Hungarian Technical Directive on Construction related to the conditions for the use of aggregates from the recycling of construction and demolition waste. The module discusses biobased materials in detail as well and includes videos on best practices regarding construction and renovation with biobased materials.

**Module “Digitisation”:** it deals with the digitalisation of the construction sector, with a special focus on the application of BIM methodology in the use phase of buildings, features maintenance sheets and material passport.

Karbantartási lap					
Azonosító	01234567				
Név	Kültéri biztonsági ajtó				
Osztályozás	Külső ajtók				
Típus	Biztonsági ajtó				
Elhelyezkedés	A012				
Anyag	ALU				
Elem ID	KA-02				
Adatlap	<a href="http://www.ajtoadatlap.hu/termekek/tipusok/biztonsagi-ajtok/01234567">www.ajtoadatlap.hu/termekek/tipusok/biztonsagi-ajtok/01234567</a>				
Beszereles dátuma	2022.10.12.				
Garancia érvényessége	2027.10.01.				
Művelet	Feladat kezdete	Határidő	Felelős	Állapot	Költség
Ütemezett ellenőrzés	2023.03.12.	2023.04.11.	XY	Feladat elvégezve	Ft
Hibabejelentés	2023.06.10.	2023.06.10.	WS	Feladat elvégezve	Ft
Ütemezett ellenőrzés	2023.09.12.	2023.10.12.	ZZ	Feladat delegálva	Ft
....	...	...	...	...	...

BIM modellből származó adatok

Külső adatbázisból (karbantartási) származó adatok

Fig. 4: Example of a Maintenance sheet

## 4.5 The Training Pack of Ireland

TUS designed four new SME training modules for the training pack customised to the Irish building sector regarding how circularity applies to renovations and retrofits of traditional buildings, which currently make up a significant 16 % of housing stock in Ireland. The main topics addressed in each module are detailed below:

**Module “Case Study Cnoc na Gaoithe, Tulla Co. Clare”:** a case study of a recent renovation of an 1880s convent building repurposed for community use in Tulla Co Clare.

**Module “Traditional Buildings Regulations & SR54”:** an introduction to how Irish building regulations apply to Traditional Buildings and SR54 (explainer on the NSAI Irish guidelines relating to traditional buildings).

**Module “Traditional Buildings Defined”:** which are built before 1945.

**Module “Building Renovation Passports (BRP) for Traditional Buildings”:** an introduction of BRPs in Ireland, a Roadmap and a Logbook. The Roadmap is a masterplan for the deep energy retrofit of a Building which sets out the measures step by step. and how BRPS will relate to traditional buildings.

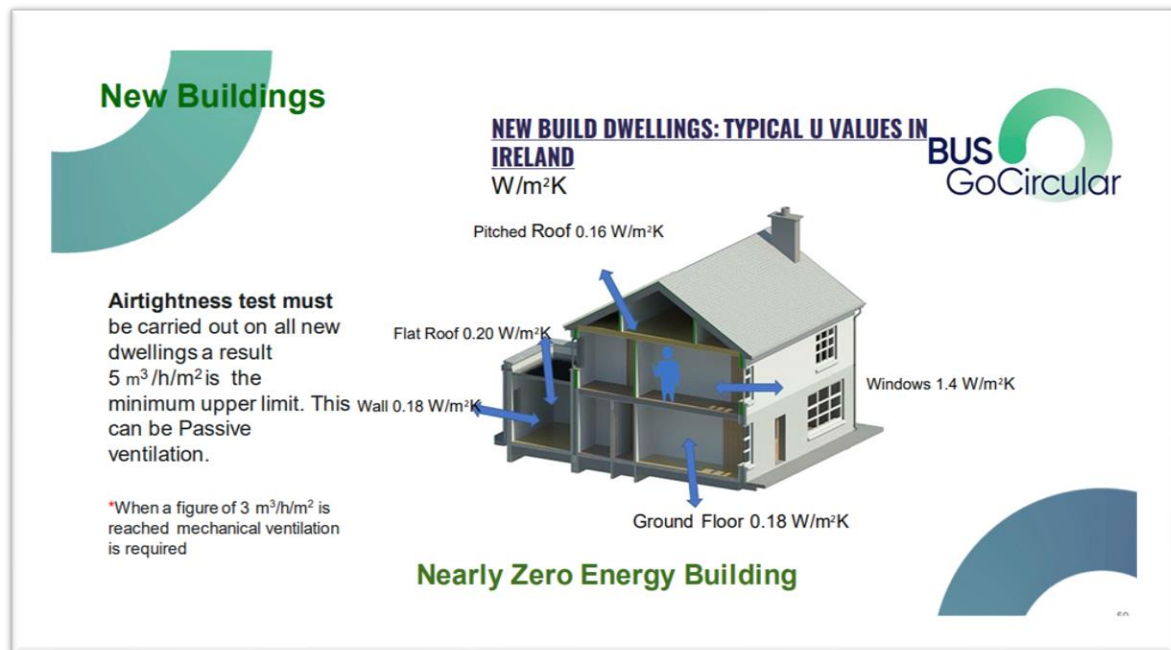


Fig. 5: Screenshot of Ireland Training Pack

The target group is **Small and Medium Enterprises (SMEs)**, which are defined in Ireland as businesses with less than 250 persons employed, they can also be further split into micro enterprises with less than 10 persons engaged, small enterprises with between 10 and 49 persons engaged and medium sized enterprises with between 50 and 249 persons engaged. The SMEs who participated in the pilot of these modules were a broad range professional and trades comprised of:

- **Partel** (25 employees). A producer and supplier of high-performance technological solutions, helping to create more efficient, sustainable residential and commercial buildings. They provide a wide range of Airtight and Windtight Systems for the green building sector. VARA, IZOPERM, EXOPERM, ALMA VERT, CONIZO and CONEXO are some of the most known brands they supply to be used extensively in the construction sector. Currently, they work in 4 regions: Ireland, UK, North America, and recently mainland Europe.
- **Climeaction** (16 employees). Climeaction is an independent, Employee-Owned certified company– working across all business sectors to develop an integrated approach to reducing emissions and a whole operations approach to decarbonisation.



- **Lawlors** (30 employees). Ireland's foremost Sustainable Design and Delivery Experts, who help clients to reach their energy and CO2 reduction goals by optimising performance in compliance with all regulatory requirements. They deliver guaranteed energy reductions through best-in-class sustainability strategies and a holistic approach and are a one-stop service for expert advice, contracting, certification, measurement, and verification of sustainability.
- **Ecological Building Suppliers** (27 employees). Set up in Athboy, County Meath in 2000, the UK division was established in 2007 and is based near Carlisle in Cumbria They bring to market the best sustainable products for all different types of buildings. And have developed rigorous assessment protocols to ensure their products meet the highest performance, environmental and sustainable building standards. Additionally they support the construction sector by creating a better-built environment through the supply of sustainable ecological building materials, solutions and deliver quality affordable products and training.
- **Glas Energy** (13 employees). Established in 2002 as a provider of renewable energy solutions and completed over 1000 renewable energy projects including more than 100 biomass systems. Glas Energy is one of Ireland's most experienced biomass solution providers . additionally they install both domestic and commercial renewable energy Photovoltaic systems. Their Kilkenny based offices are powered by Hydro- renewable energy from the River Nore and heated by a district biomass heating system

The modules are now available as self directed training videos with an interactive quiz at the end of the recording with a validation survey to gain feedback after the self- assessment quiz. The whole pack of modules are published and available on the BUS-GoCircular project's website (<https://busgocircular.eu/training/>) and TUS websites.

## 4.6 The Training Pack of Netherlands

Moving to the Netherlands, the partner Building Changes has developed a specialised module centred on the **soft skills necessary for sustainability managers** within companies. This work originates from a discussion with the Dutch Green Building Council, where it was envisioned as a potential follow up for their Future Leadership programme. Their observation was that sustainability managers in companies are given a great responsibility, i.e. to ensure that the entire company transitions to a more sustainable way of working. Leading up to the new European monitoring requirements from the

Corporate Sustainability Reporting Directive (CSRD), more and more companies are starting to feel the pressure and urgency for this transition.

However, the typical Sustainability Manager who is tasked with leading this change, is not the “line manager” of his/her colleagues. Therefore, it requires a specific form of leadership. This includes fostering an environment where colleagues can take ownership of circular practices. The primary audience comprises **medium-sized enterprises**, and the module draws upon recent mentoring work and extensive expertise gained over years of collaboration with previous clients.

Building Changes has drawn from the methodology of “Engaging Dynamics”, which provides useful insights and tools for the role of the Enabler within organisations, both in informal and formal settings. This methodology structures how someone in an Enabler role can help their colleagues understand how to take ownership over their own role and responsibilities.

Building Changes has customised a training pack that translates these insights from the “Engaging Dynamics” method for the Sustainability manager. The validation process for this module occurred in practice, through real-world meetings and application within real life companies such as De Vries & Verburg and Infinity Repair BV.

## 4.7 The Training Pack of Spain

The Spanish partner IVE has crafted a module focusing on providing **tools to support professionals in designing circular buildings**. The target group comprises designers of circular buildings, primarily **architects and engineers**. While the module does not currently include case studies, it features several videos prepared by IVE.

More specifically, the tools presented at the Spanish TP are four: RE10, RCDs, TURIA and BDC 2023. All of them advise architects and engineers at the design stage of their projects on the circular aspects of the buildings, elements and materials to be used.

- “**RE10**” is an online tool developed by IVE, based on the Spanish standard ISO 20887:2020, which assesses the circularity of a residential building after renovation. More specifically, “RE10” evaluates the efficient use of natural resources and the building’s capacity for disassembly, flexibility and adaptability, in order to favour its reuse and recycling. [More information.](#)

- **“BDC 2023”** is a database and operates as a “Construction Materials Price Bank”. It is used to estimate the total measurements and budget that the construction/renovation work will cost. This new version “BdC 2023” incorporates functional units for circular solutions such as bio-based products, wood-based building systems or products with high recycled content. This addition streamlines the budget calculations for construction sites that incorporate circular solutions. It reduces uncertainties for developers looking to invest in innovative and sustainable practices boosting the market demand. [More information.](#)
- **“TURIA”** is an online tool developed by IVE that provides an "Environmental Assessment Report" of your project. It includes indicators on Toxicity, Resource Use and Environmental Impact of building elements and products, as well as a list of building materials and their reuse potential. [More information.](#)
- **“RCDs”** is an online tool that assists in the proper management of Construction and Demolition Waste (CDW) during construction work, providing a detailed report on the actions to be taken and an economic quantification of the cost of these actions. [More information.](#)



*Fig. 6: Tools presented at the Spanish Training Pack*

A preliminary survey was conducted through an online form in October 2023, which garnered 23 responses, providing valuable insights into client interests regarding topics, duration, and modality of the offered courses.

## 4.8 The EU Training Pack

Finally for the general EU, ACE has contributed a module offering an overview of the **EU policy framework** for the construction sector. Designed for **architects and professionals in the design and construction sector**, the module gives an overview of the most relevant EU directives on sustainability and energy efficiency.

The module provides a timeline about the evolution of the climate policy from the 90's up to now and then focuses on the EU framework encompassing the European Green Deal, the European Climate Law, Fit for 55 package, Energy Performance of Buildings Directive (EPBD), the Energy Efficiency Directive (EED) and the Renewable Energy Directive (RED) and the New European Bauhaus.

The module are freely available at the BUSGoCircular website (<https://busgocircular.eu/training/>) and also at BUSGoCircular community at Zenodo platform (<https://zenodo.org/records/10245042>)

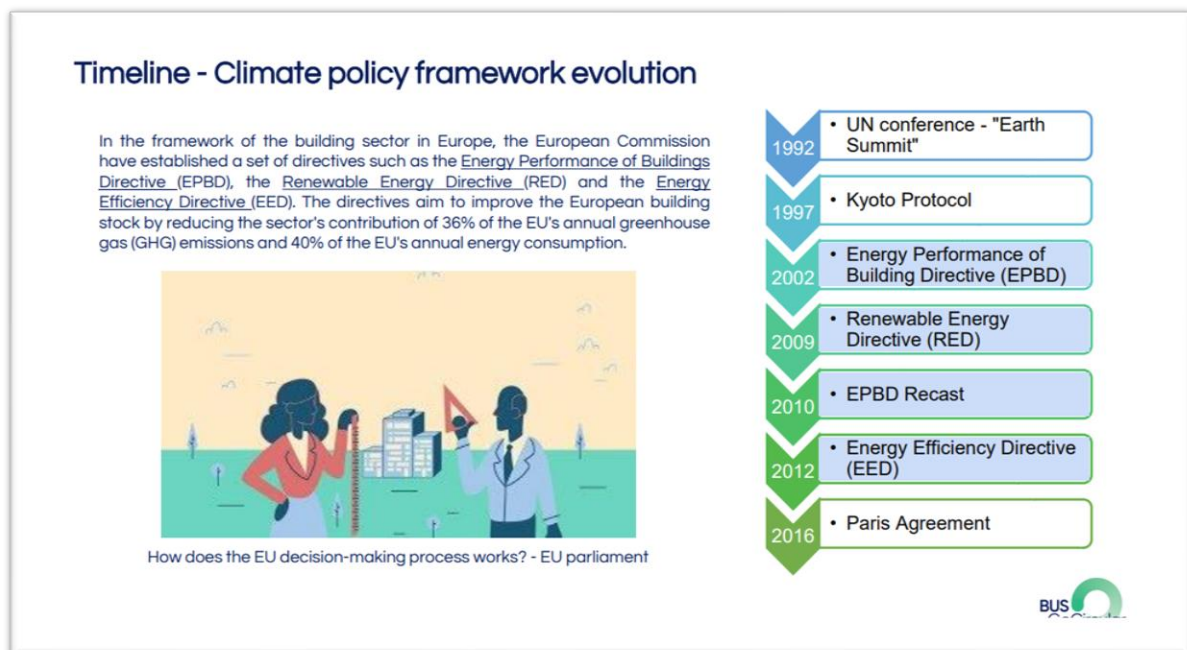


Fig. 7: Screenshot of EU Training Pack

## 5. Validation

The proposed training packs, in order to be published, have been consolidated with SMEs in the construction sector and national/regional associations benefiting from them, and corroborated with other related public stakeholders in order to have a real market validity and improve the qualification of the circular economy workforce.

### 5.1 Validation of the Training Pack of Bulgaria

Modules of the Bulgarian Training Pack have been initially conceived through meetings with representatives from the Association for Building with Natural Materials in Bulgaria and Institute for Circular Economy (BG). Their input was regarded in the numerous examples shown from Bulgaria and in the topics concerning definition of sustainable materials.

A link leading to an online survey is added at the end of the course in the PDF. The intention of this action is to provide continuous feedback from users of the modules. This would serve as both a recommendation for improvement and inquiry into the actual needs of interested parties with regards to circular transformations within the construction sector.

The overall aim for the development of this pack coincides with the intentions of structuring a Continuous Professional Development (CPD) framework for sustainable and energy efficient buildings in Bulgaria as part of a greater national effort to significantly improve and reform professional training and education in construction (and not only). Thus the course could be made available as training content for the CPD to interested parties and as result will be subject to consistent improvement and modifications to reflect expert and business needs on the topic and within the sector.

### 5.2 Validation of the Training Pack of Croatia

The validation process for UZ-FCE's modules was conducted via survey in January 2024, which garnered 10 responses, providing valuable insights into client interests regarding topics, duration, and modality of the offered courses.

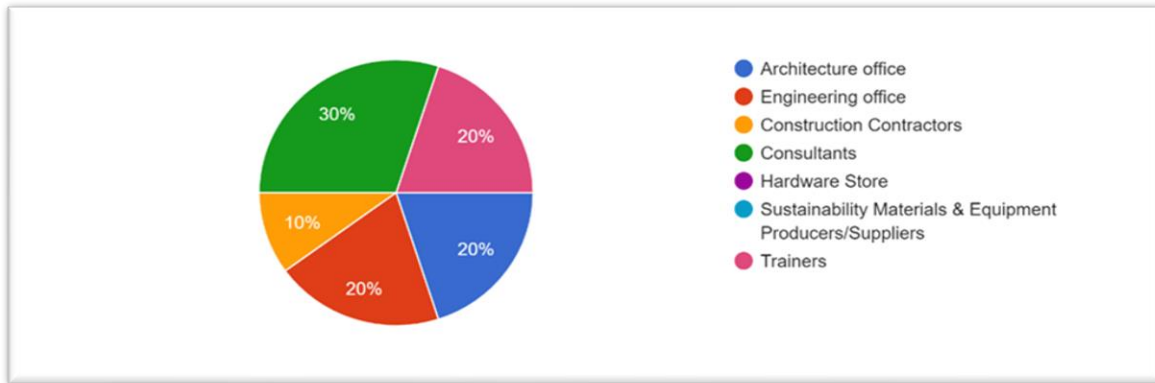


Fig. 8 Type of SMEs where the surveyed persons work

Even though the number of respondents is relatively small, the responses are well distributed across most of the target groups among the interest groups on which the survey focussed.

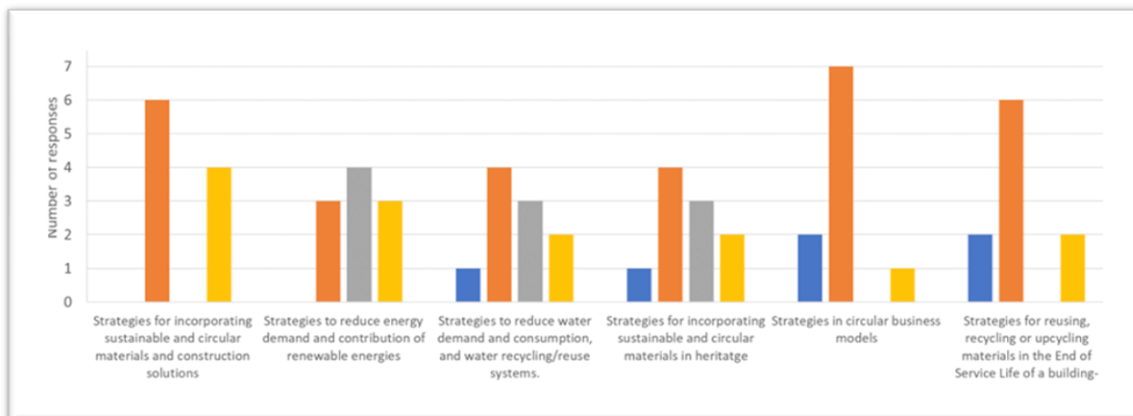


Fig. 9: Self declaration of surveyed persons on their respective level of knowledge on the offered topics

We can observe the reported levels of knowledge and application of various sustainability strategies across different job roles. For example, Trainers generally report having basic knowledge but have never applied strategies for incorporating sustainable and circular materials and construction solutions, while architecture offices and consultants tend to have varying levels of expertise, with some regularly applying these strategies in their work. There is a mix of knowledge levels across all job roles, with some reporting basic knowledge and others reporting intermediate to expert levels of knowledge and application.

Overall, the data suggests a diverse range of knowledge levels and applications of sustainability strategies across different job roles. While some individuals and organisations demonstrate expertise

and regular application, others report basic knowledge and limited application. Addressing this variability may require targeted training and education initiatives to ensure consistent understanding and implementation of sustainable practices across the board. This also confirms that targeted micro qualifications are a good way to tackle these findings.

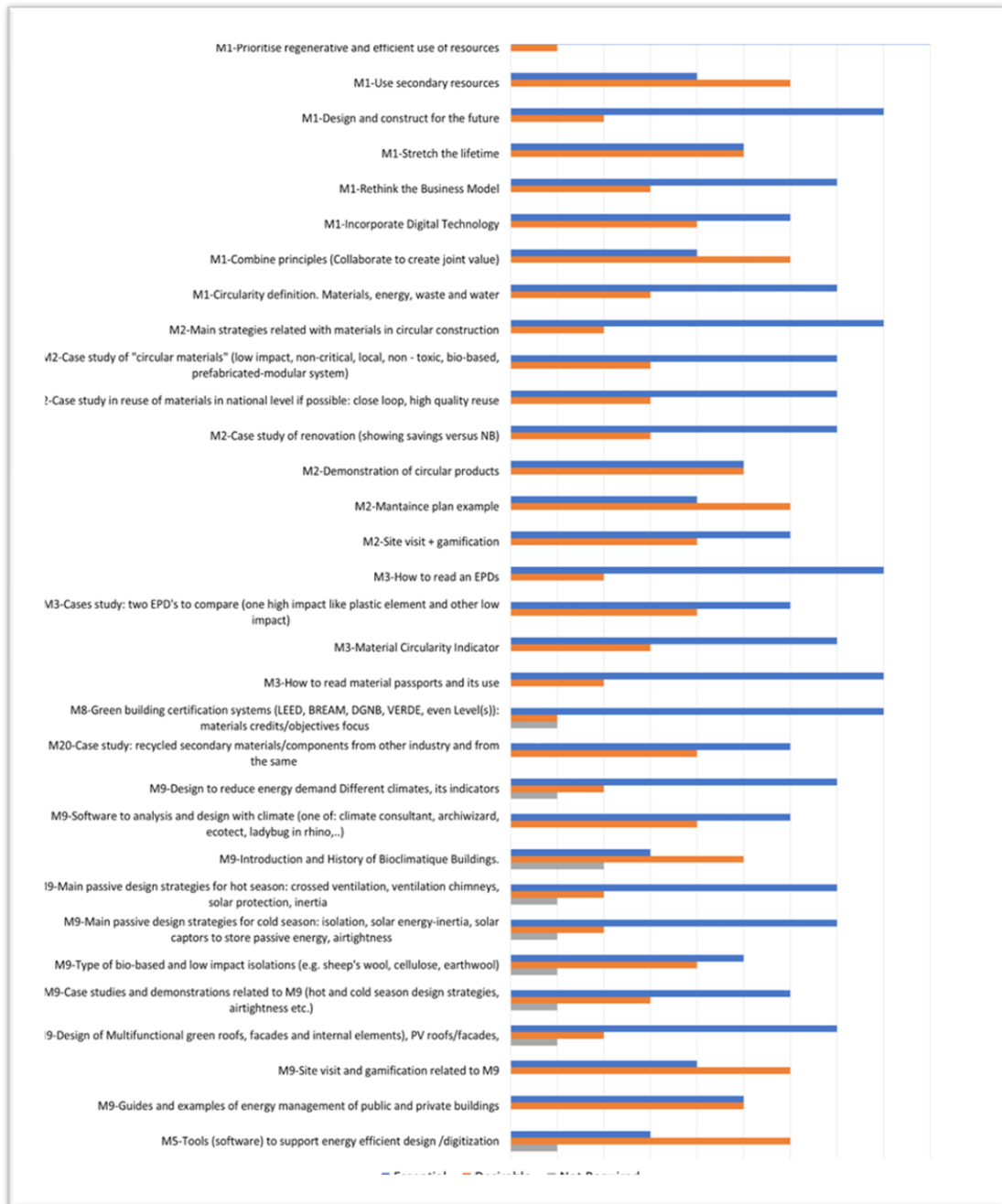


Fig. 10: Opinion of the surveyed SMEs on the Croatian Training Pack modules and topics – according to relevance

The data gained from surveyed Croatian SMEs provides insights into the perceived relevance of different topics for upskilling knowledge in circularity within SMEs. **Prioritisation of regenerative resource use, efficient design for the future, and stretching product lifetime** emerge as essential across all responses, indicating their critical role in the Croatian training pack.

Additionally, strategies related to circular materials, reuse, and business model innovation are consistently rated as essential or desirable, highlighting their perceived importance for Croatian SMEs.

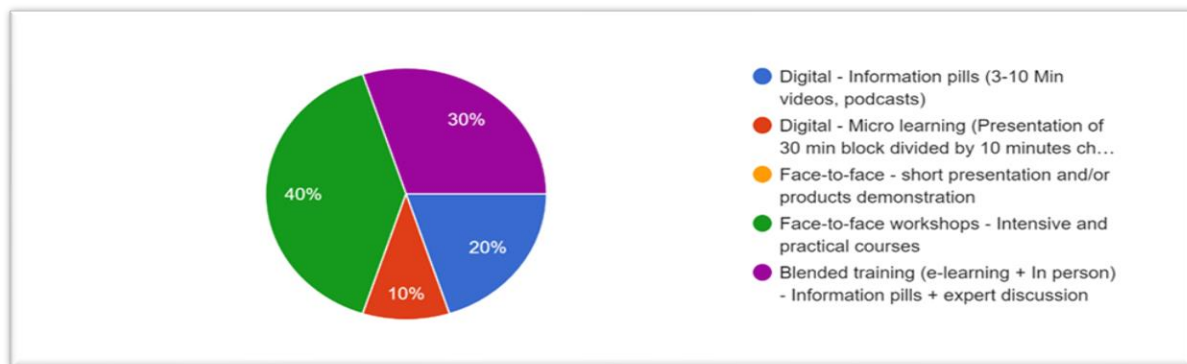


Fig. 11: Opinion of surveyed SMEs about the training methods most suitable to deliver Croatian Training Pack modules

The responses indicate a preference for a **mix of training methods**, with a strong emphasis on face-to-face workshops and blended training combining e-learning with in-person sessions. Face-to-face workshops - Intensive and practical courses are favoured by SMEs, indicating a preference for hands-on, immersive learning experiences. Blending e-learning with in-person sessions allows for flexibility and depth of learning. The combination of information pills with expert discussions suggests a desire of SMEs for structured content delivery supplemented by interactive dialogue. Digital - Micro learning (Presentation of 30 min block divided by 10 minutes challenges) approach emphasises shorter, bite-sized learning modules, catering to attention spans and allowing for easy integration into busy schedules of SMEs.

Overall, the responses reflect a recognition of the **importance of flexibility, interactivity, and practicality** in training methods within the SME context. Combining traditional face-to-face workshops with digital learning tools allows for a comprehensive and adaptable approach to skill development, catering to the diverse needs and preferences of SME employees.



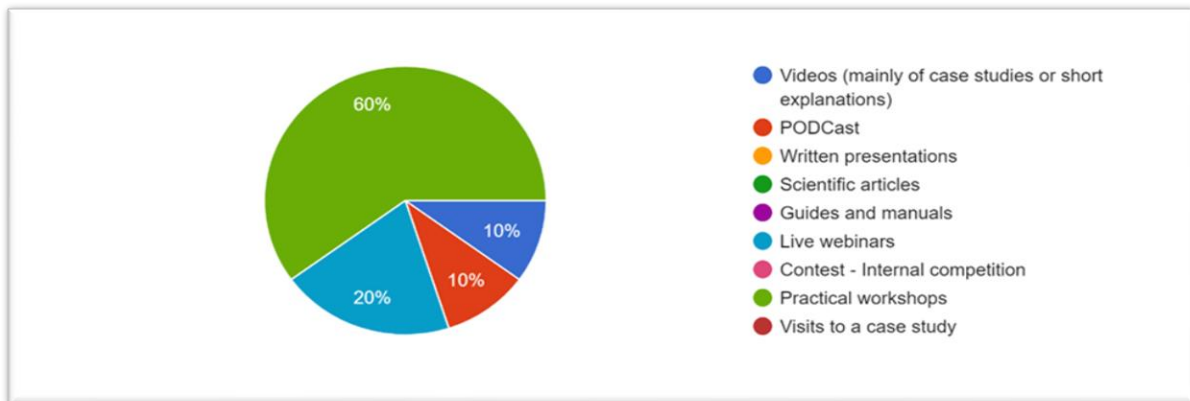


Fig. 12: Opinion of surveyed SMEs about the training format most suitable to deliver Croatian Training Pack modules

The survey responses overwhelmingly favour **practical workshops** as the preferred training format within the SME context, with repeated selections indicating strong preference. This preference underscores the value of hands-on, interactive learning experiences for SMEs, allowing for direct engagement with practical skills and knowledge relevant to their operations. The mention of videos and webinars suggests a secondary interest in digital learning formats, albeit less prominently. Overall, the emphasis on practical workshops aligns with the SME context, emphasising the importance of tangible, experiential learning opportunities to maximise training effectiveness and applicability to real-world scenarios.

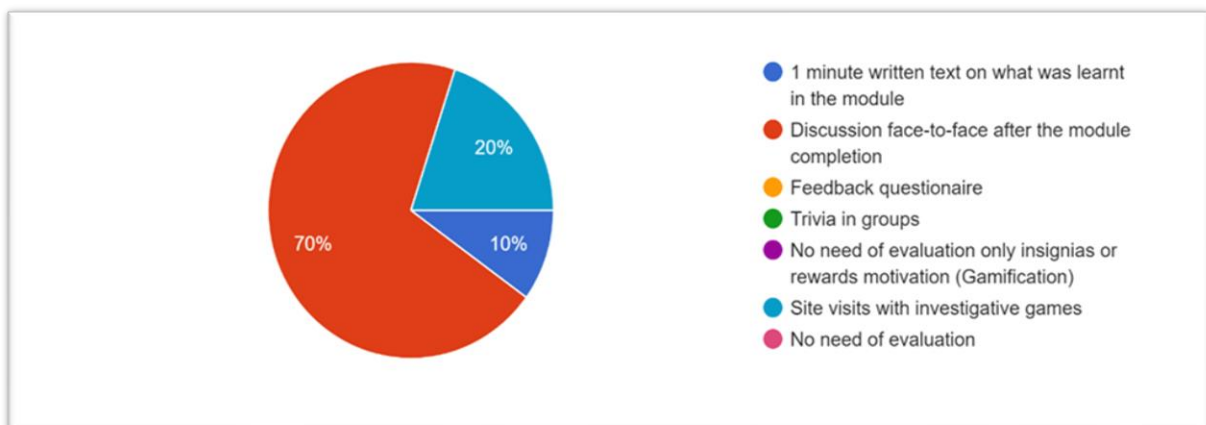


Fig. 13: Opinion of surveyed SMEs about the best evaluation methods most suitable

The survey responses overwhelmingly favour face-to-face discussions post-module completion, indicating a preference for direct interaction and verbal communication. This method may facilitate

in-depth exchanges of ideas and feedback, fostering a deeper understanding of the material. Additionally, the suggestion of site visits with investigative games suggests an interest in hands-on, experiential learning. However, the lone mention of a 1-minute written text reflects a minimalistic approach to evaluation, potentially overlooking the depth of understanding gained. Overall, the emphasis on personal interaction underscores the value of human connection in the learning process within SME contexts.

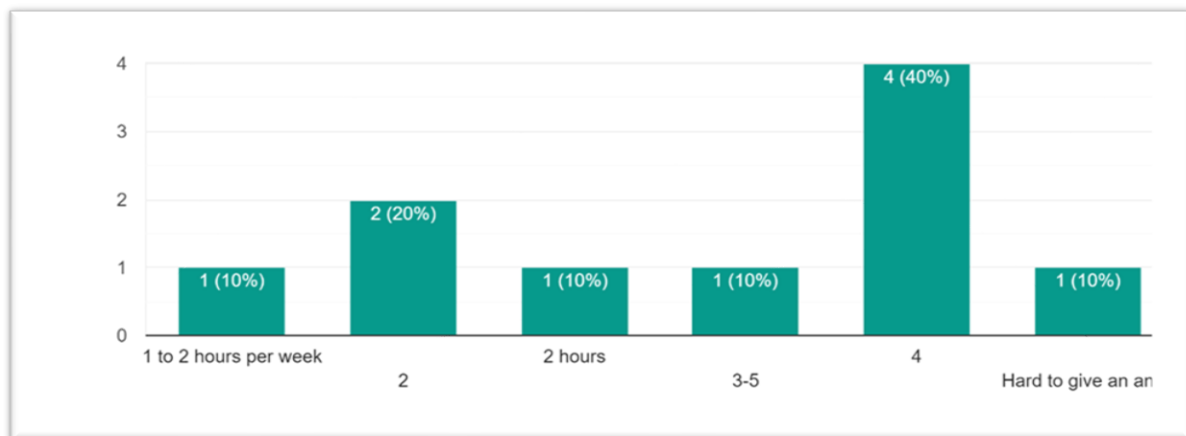


Fig. 14: Opinion of surveyed SMEs about the optimal weekly CPD training duration

One of the surveyed SMEs said: *“Hard to give an answer - everyday tasks may also be seen as professional development, it does not have to be dedicated training. Hard to quantify, should be integrated.”*

### 5.3 Validation of the Training Pack of Czechia

In Czechia, validation of the training packs was conducted by interviews and meetings with 5 relevant stakeholders. They helped with form and grammar of the translated parts as well as provided valued insight from their professional point of view. Mentioned reviewers were David Staněk, CVUT, KOMA Modular, UCEEB, CIRI HK.

The training packs have been adapted accordingly and the gamma presentation content might still be adapted to their individual needs in the future, however, for now the feedback has been gathered and used to prepare the final version that is available on the BGC website.

## 5.4 Validation of the Training Pack of Hungary

The Hungarian training pack was validated through an online questionnaire. The experts who reviewed the training pack are architects, engineers, facility managers, project managers and LCA experts.

The level of knowledge of the experts completing the validation is shown in the figure below and it varied between basic and expert.

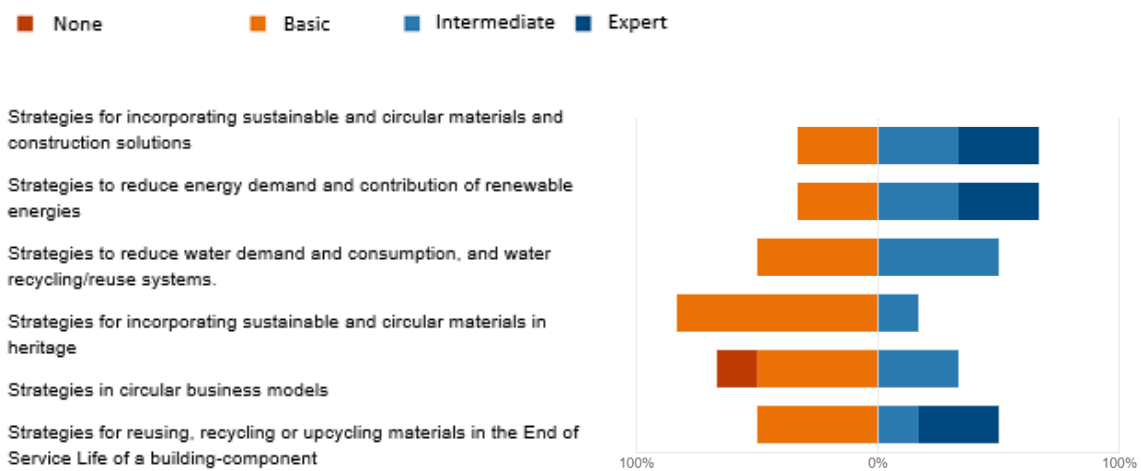


Fig. 15: Level of knowledge

The respondents were asked about the topics of the module they found particularly important and interesting. They mentioned that the entire module is very useful and highlighted the use of construction and demolition waste, biobased materials.

On missing elements, the following were pointed out: sheltering, rainwater insulation, highlighting professional collaboration, regulating the market environment (tax incentives for circular technologies), earthworks.

All participants agreed the topic is relevant and interesting, also the allocated time is adequate for the learning process.

The best training method which suits within the SME context would be personal workshops and microlearning.

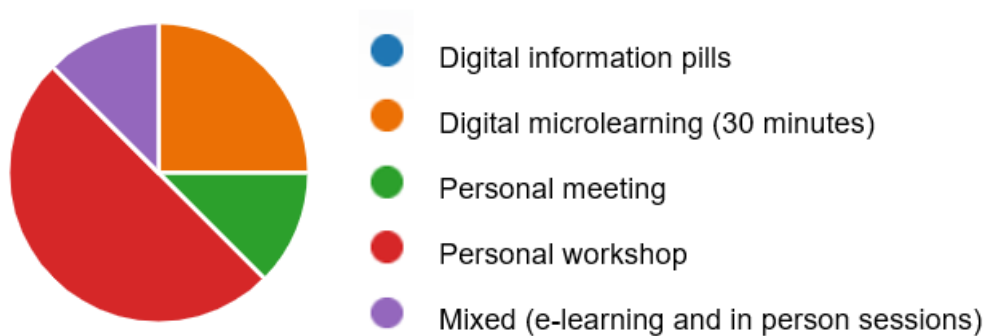


Fig. 16: Training methods suitable for SMEs

For evaluation the respondents agreed that questionnaires and group quizzes are the best methods and they also emphasised that 2-3 hours weekly would be necessary for SME workers for upskilling themselves.

The experts suggested continuously updating the material, due to the fact that this field is rapidly developing and changing.

## 5.5 Validation of the Training Pack of Ireland

SMEs were invited to follow the self-directed learning modules and afterwards they gave comprehensive feedback through a post course survey. The survey was conducted through microsoft online forms and gathered 8 responses, which were all positive regarding the training modules. It was communicated to TUS through feedback discussions that the training would be shared across the organisations and other people in the construction sector. All the attendees agreed that **self-directed quizzes** are the best methods. The ratings were high, and comments portrayed that the trainees were very satisfied with all the training modules.

The four modules were rated as follows:

- Module “Tulla Case Study”: rated 10 out of 10.
- Module “Traditional Buildings Regulations & SR54”: average rating 9.25 out of 10.
- Module “Traditional Buildings Defined Feedback”: rated 10 out of 10.
- Module “Traditional Buildings- Building Renovation Passports Feedback”: rated 7 out of 10.

## 5.6 Validation of the Training Pack of the Netherlands

The Netherlands Training pack was validated in real-life company cases from De Vries & Verburg and Infinity Repair BV, where the application of Engaging Dynamics into the field of circularity was tested in the field, and thus validated.

Engaging Dynamics is a coaching and mentoring methodology that develops tools to enable the transfer of (thematic) ownership from one actor to another (these are called the Initiator and the Actor). The role of the Enabler is in itself an essential third role in this dynamic.

We applied the Engaging Dynamics methodology to the context of Sustainability Managers, thus conceptualising their role as enablers, being tasked with ensuring that the circularity goals from higher management get effectively transferred to tactical and operational personnel (such as builders and project leaders).

These project leaders and builders need to take ownership of circularity, but can be reluctant to do so. The sustainability manager is there to make sure they do. This skill is essential for a successful transition into circular ways of working.

## 5.7 Validation of the Training Pack of Spain

In Spain, a preliminary survey was conducted through an online questionnaire to understand the profile of potential students and their interests regarding the format, duration, and topics for the course. A total of 23 responses were obtained, with the majority coming from small and medium-sized enterprises with up to 50 employees (19 responses), and 4 responses from large companies with more than 50 employees. Regarding the duration of the courses, there were diverse responses ranging from very short courses (6 hours) to longer ones lasting up to 60 hours.

In terms of the most demanded topics, there is a prevailing interest in "**energy audits**" accompanied by a desire for "**real cases of energy rehabilitation**". Other indicated topics include acoustic comfort in buildings and the design of more circular and healthy urban spaces.

Actividad empresarial	Número de empleados	Temas formativos de interés	Horas de formación
Arquitectura	1-10	Mejora de la eficiencia energética de los edificios existentes	40
consultoría e ingeniería	más de 50 personas	Manejo de la nueva aplicación del IEEV.CV (GESIEE) a través de un caso práctico	30
ARQUITECTA	1-10	Rehabilitación energética en el marco de los fondos Next Generation	25
estudio de arquitectura	1-10	Mejora de la eficiencia energética de los edificios existentes	60
Despacho Técnico	21-50	Caracterización de lesiones en edificios y redacción del informe IEEV.CV	60
despach arquitectura	1-10	Rehabilitación energética en el marco de los fondos Next Generation	10
Arquitecto	1-10	Diseño y planificación de viviendas y entornos residenciales para la vida cotidiana	indiferente
Asociación profesional	más de 50 personas	Casos reales de rehabilitación energética de edificios residenciales	30
Arquitecto	1-10	Verde es barrio: Diseño de espacios urbanos más circulares, sostenibles y saludables	6 horas
Arquitecto	1-10	Diseño y planificación de viviendas y entornos residenciales para la vida cotidiana	6 horas
Arquitecto	1-10	Reestrena Barrio (próxima inscripción)	6 horas
Estudio de Arquitectura	1-10	Diseño y planificación de viviendas y entornos residenciales para la vida cotidiana	no sé
administración pública	más de 50 personas	Mejora de las condiciones acústicas de los edificios	20 h
Funcionario interino	1-10	Inspección y diagnóstico de edificios	20
Despacho Arquitectura técnica	1-10	Casos reales de rehabilitación energética de edificios residenciales	dos semanales
Arquitectura	1-10	Verde es barrio: Diseño de espacios urbanos más circulares, sostenibles y saludables	60
Arquitecto Técnico	1-10	Análisis energético de los edificios	30
Arquitectura	1-10	Rehabilitación energética en el marco de los fondos Next Generation	8
Construcción	más de 50 personas	Mejora de la eficiencia energética de los edificios existentes	40
Arquitectura	1-10	Mejora de la eficiencia energética de los edificios existentes	10 en adelante
ARQUITECTA TÉCNICA	1-10	Mejora de las condiciones acústicas de los edificios	30
Arquitecto	1-10	Análisis energético de los edificios	1 hora diaria

Fig. 17: Summary of the 23 responses to the online survey in Spain

## 5.8. Validation EU Training Pack

The validation process involved a pre-material development survey sent to 4 members of the Architects' Council of Europe working as sustainability consultant, architects, and head of design. The survey covered the training method, the training format, the evaluation, time availability and the training content.

The most voted training method for Continuous Professional Development was the **blended training**, followed by Face-to-face workshops (Intensive and dynamic), Face-to-face (Short presentation and/or product information) and finally learning pills (3-10 min videos).

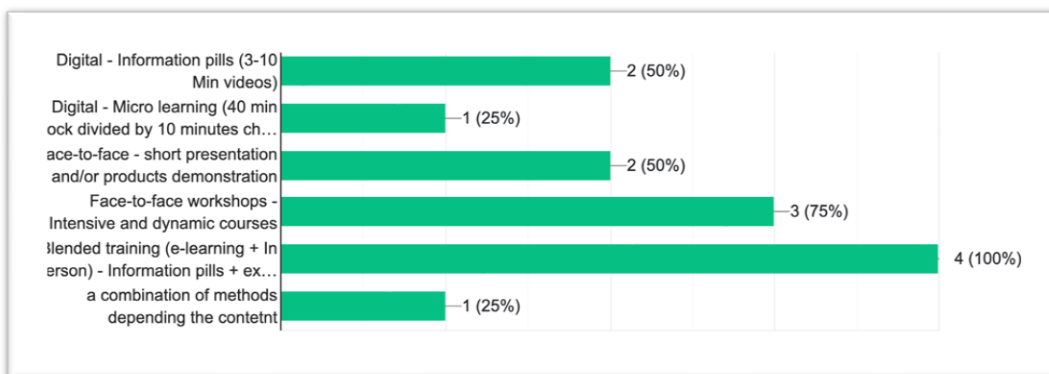


Fig. 18: Best training methodologies for CPD

The best training format was **live webinars and guides and manuals** followed by videos.

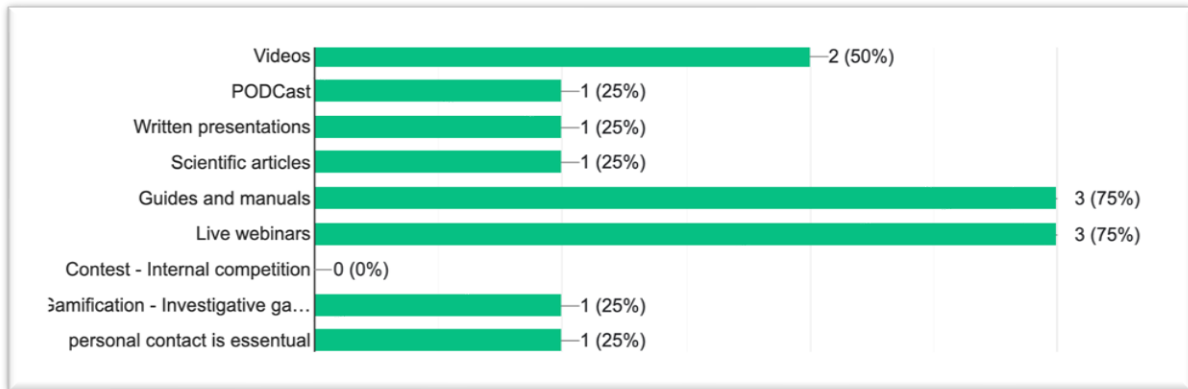


Fig. 19: Best training format for CPD

The best evaluation was a feedback questionnaire, followed by a discussion after the module completion.

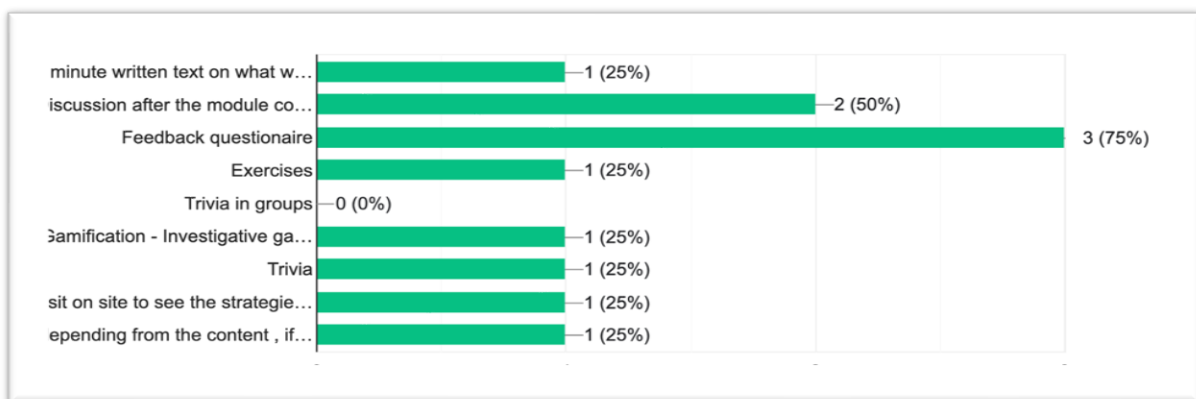


Fig. 20: Best evaluations methodologies for CPD

The time commitment most voted by the participants was between one to five hours per week.

The participants ranked the most important topics on the field of circularity. It encompassed design to reduce energy demand, design to reduce energy consumption, banks and certification for materials, use of secondary resource, and digitalisation.

The module design was validated by ACE Environmental and Sustainability chairperson, and ACE policy officer.

## 6. Conclusions

Below is the comprehensive summary table outlining the eight Training Packs conducted within the BUS-GoCircular project. This table encapsulates the theme or topic, target audience, and detailed contents of each, providing a succinct yet informative overview of the breadth and depth of the training initiatives undertaken.

Country	Theme/Topic	Target Audience	Content
Bulgaria	Management, availability, and selection of sustainable building materials and products for construction, circular economy	Small and medium-sized construction enterprises	Sustainable construction materials and products. Zero waste construction with natural materials.
Croatia	Circularity and resource efficiency in construction	Architectural and engineering offices, professionals, and SMEs	Tools for circular design in materials. Green building certification systems. Digital technology's role in sustainable construction.
Czechia	Circular design in biological materials, material circularity	Manufacturers , educational institutions, NGOs	Strategies of circular design in materials. Tools to support circular design in materials.
Hungary	Circular construction materials, digitization	Blue-collar workers, SME workers, university students	Build to Close the Loop of Materials. Digitisation.
Ireland	Circularity in renovations and retrofits of traditional buildings	SMEs in the Irish building sector	Four modules on case studies, building regulations, traditional buildings, and Building Renovation Passports




Netherlands	Soft skills for sustainability managers	Sustainability managers in medium-sized enterprises	Focuses on leadership and fostering circular practices within companies
Spain	Tools for designing circular buildings	Architects and engineers (AEC)	Presents tools such as RE10, RCDs, TURIA, and BDC 2023 for assessing circularity and environmental impact.
EU	EU policy framework for the construction sector	Architects and professionals in design and construction	Provides an overview of relevant EU directives on sustainability and energy efficiency.

The validation process of the 8 Training Packs has provided valuable insights into the preferences, needs, and expectations of stakeholders within the construction industry regarding circular economy training. Here are some key takeaways:

- **Diverse Training Formats and Modalities:** The validation process revealed a preference for diverse training formats, including face-to-face workshops, blended learning combining e-learning with in-person sessions, practical workshops, and microlearning. This reflects the importance of flexibility and adaptability in training methods to cater to the diverse learning styles and schedules of SMEs and professionals.
- **Relevance of the Topics:** Across the different Training Packs, certain topics consistently emerged as crucial for upskilling in circularity within the construction sector. These include prioritising regenerative resource use, efficient design for the future, stretching product lifetime, strategies related to circular materials and reuse, and green building certification systems.
- **Duration of training modules & packs:** The optimal duration for training courses varied, with suggestions ranging from one to five hours per week. This highlights the importance of balancing content depth with time efficiency to ensure effective learning outcomes while accommodating the busy schedules of SME workers.
- **Continuous Feedback and Improvement:** The incorporation of feedback mechanisms, such as surveys and post-course evaluations, is essential for continuous improvement of the Training Packs. This iterative process allows for the refinement of content, formats, and delivery methods to better meet the evolving needs of learners and industry stakeholders.

- **Importance of Validation:** The validation process ensures the market relevance and effectiveness of the Training Packs by gathering insights from industry professionals, SMEs, and relevant stakeholders. It helps identify areas for improvement, refine content, and tailor training programs to address specific challenges and opportunities within each country's construction sector.

Overall, the collaborative effort in developing and validating the Training Packs reflects a proactive approach to addressing the challenges of transitioning towards circular construction practices. By incorporating multimedia elements, diverse training formats, and continuous feedback mechanisms, these Training Packs aim to empower professionals and SMEs with the knowledge and skills needed to drive sustainable and circular innovation within the construction industry.



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