D3.4 Content and methodology proposal “BUS-GoCircular Fundamentals Training Packs”

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List of acronyms and abbreviations

BIM: Building Information Model / Management

BGC: BUS GoCircular project

BUS: Build Up Skills

EQF: European Qualification Framework

EoSL: End of Service Life

EPD: Environmental Product Declarations

EU: Europe

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 Plan

ULO’s: Units 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 (T2.3).

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:

1. 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.
2. 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.
3. Rethink the business model: Consider opportunities to create greater value and align incentives that build on the interaction between products and services.
4. Incorporate digital technology: Track and optimise resource use and strengthen connections between supply chain actors through digital, online platforms and technologies that provide insights.
5. Strengthen and advance knowledge: Develop research, structure knowledge, encourage innovation networks and disseminate findings with integrity.

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1. Introduction

In order to enable SMEs to train their staff in a simple, attractive and short way and make them aware where to search for skilled staff, eight training packs will be designed, representing an effective tool for improving skills. Based on the work of “Report assessing available training materials”[1], the content and methodology of the “BUS-GoCircular (BGC) Fundamentals Training Packs (FTP)" will be an attractive and low-cost training format for companies. The BGC FTP[2] aims to facilitate SMEs upskill their workforce by addressing their 2 main barriers to do so: money and time. Thus, these training packs will be consolidated with the same future clients, the SMEs of the construction sector and national/regional associations, and corroborated with other public related stakeholders to have a real validity in the market and upskill the workforce in the 8 keys principles of circular economy in construction[3] (work developed in “BUS-GoCircular training packs”[4]).

This document is intended to serve as a guide. It aims to provide all the necessary inputs to create the 8 national training packs for SMEs, providing examples of training plans as a conclusion. These training plans can be used to develop the training packs as well as to enable SMEs themselves, if necessary, to form different training packs according to their particular needs. In the training plans presented in section 5. Packs and Index of Content (and more detailed in Appendix 1: Index of contents of TP1, TP2, TP3 and TP4), it is shown all the contents, methodologies, timing and evaluation that are considered appropriate to achieve the minimum global knowledge on circularity in construction. All of this is according to the workers' SMEs profiles and the material found or available at the time of developing the pack.

From the BGC project, as mentioned, eight packs will be developed in eight different languages adapted to the national context of each participating country[5]. The modules to be developed will be chosen within the training plans proposed in this report. Therefore, the use of this guide will enable each country to create its own training pack adapted to national needs. However, all packs must include a common initial module on the 8 key elements of circular economy (as the one included in the training plan examples). A training pack will

[1] Report: https://busgocircular.eu/report-assessing-available-training-materials/
[2] BUS-GoCircular Fundamentals Training Packs
[3] https://www.circle-economy.com/circular-economy/key-elements
[4] Report in: https://busgocircular.eu/results/
[5] One for the following countries: Bulgaria, Croatia, Czech Republic, Hungary, Ireland, Netherlands and Spain.

also be produced at European level, in English. It is worth mentioning that the training plans examples designed can also help Trainers[6] to develop their educational plans and courses regarding all aspects of circularity in construction[7].

This report will include the following:

- Different profiles of SMEs in construction sector
- Training methodologies which will be used
- Detection of each needed plan and the index of contents related
- Free access training material found, related to those contents (at the time of submission of this report).
- Evaluation proposal
- Example of the 4 Training Plans according to different professional profiles
- Initial validation proposal of the Training Plans
- Fundamentals training packs will be further worked out and distributed in “BUS-GoCircular training packs report”[8]. The EU pack will be available online and in the BUILD UP Skills advisor-app[9] to be easily replicable.

The BUS-GoCircular Fundamentals 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 to cause 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 in relation to the circular economy, stopping 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 the circular construction. 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.

[6] It serves as a complementary guide to the report "Design of Programme for Training of Trainers" where the Trainers will conduct pilot courses for different construction profiles in each participating country.
[7] Especially if Training Plan 2, 3 or 4, depending on the bluecollar or whitecollar profile, are fully developed.
[8] Report in: https://busgocircular.eu/results/
[9] https://busleague.eu/build-up-skills-advisor-app-upskilling-made-easy/

The training plans responds 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 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. Also, there is the problem of dispersed, unordered or unclassified material available online. The aim is to make sense of and classify this existing material before the creation of a new one. If it is needed, new training materials will be created. The designed plan provides the basis of a training pack that can be used in its entirety to prepare unskilled workers, but is also flexible enough to adapt and use selected modules according to the contextual needs of companies.

In this report, four different training plans for designing the packs are developed according to initial skills and according to the needs of two different profiles of SMEs. Profiles who need a global and conceptual vision and those who need specific practical tools, detecting the aspects of the framework that affect them most. These open source training plans (and future packs developed) will be available on the BGC website for anyone to use in their company. The aim is promoting a harmonized and standardized approach for a large number of companies within the construction sector, looking to get a long-term availability of the product created at national level (in national language) and also, internationally renowned organizations within the EU level (English). The national level packs that will be developed will be for Bulgaria, Croatia, Czech Republic, Hungary, Ireland, Netherlands and Spain.

In defining them, all options will be explored to reduce the financial investment needed by SMEs to benefit from the package. For example, the creation of more specific and shorter packages for certain highly specialized profiles (and thus reduced investment) or even the possibility of co-financing with private companies. The pack will be different depending on who it is intended for, establishing a clear difference between “white-collar” (technical workers) and “blue-collar” (site workers).

2. Objectives and scope

The main objectives for BUS-GoCircular Fundamentals Training Packs are:

- Develop attractive and low-cost training programs/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 with regard to the circular economy in the construction sector.
- Provide free materials found on a platform. A platform between SMEs to post material, network tips and synergies (BUILD UP Skills advisor-app)
- Possible financing for the full development of these packs in companies (missing materials, workshop materials, tutors when necessary, advertising, distribution).
- Update BUILD UP Skills advisor-app

The challenges for BUS-GoCircular Fundamentals Training Packs would be:

- Challenge remains to apply the diversity of most suitable learning methods in the course for a wide range of professionals and tradespersons;
- Some of the materials collected are available only in one language
- In face-to-face methodologies, the search for a specialist tutor for the knowledge you want to implement can be complicated in some cities.
- The investment to develop some materials or workshops may make it unaffordable for the company, if a sponsor cannot be found.
- The management and updating over time of the training materials proposed in the modules. The expiration of these or, on the opposite, the lack of inclusion of innovation if they are not updated.
- Publicity and encouragement to implement the packs in SMEs.
- Link some packs to the BUS League certificates or other projects to provide the workforce with work specialized certificates.
- Relate to the European Qualification Framework (EQF) levels.

3. Profiles

In order to detect companies related to the construction sector and the professional profiles involved in them, the first step was to analyze the professions extracted from the PROF/TRAC[10] project/methodology. The second step was to distribute them according to their participation in the five main stages in which a construction project is developed, which are: Plan, Procure, Construct, Operate and End of service life. Also, they were divided into two categories of workers: blue-collar workers who are manual laborers with usually vocational training (trade school) or no formal education and white-collar, with technical, administrative, or management roles in jobs and more regulatory education degrees like university or postgraduate. In the following table we can observe the classification:

PROFILE		PLAN	PROCURE	CONSTRUCT	OPERATE	EoSL
White-collar	GENERAL	AR, CE, C, AM, FaM	PD, PM	C, BS, SS, PD	FaM	
	SPECIALISTS	UP,LA, FDE, EL, ME, EE, DA, BEC, SC	MS	HS, BEC, SC	DA, HS, BEC, CO	DeL, DeA, SC
Blue-collar	GENERAL			Br	RM	
	SPECIALISTS			II, FM, FW, R, Gd, WI, BA, P, EI, RESI, RWT, HPI, VI		DeL, DeA

The abbreviations of the professions listed in the table can be found in the Appendix 3 "Reference professions and trades".

3.1. Companies in construction sector

Once we have the professions detected, we list the existing companies in the construction sector that host these profiles and relate them to the stages of construction in which they are involved.

Some companies cover more than one stage even in non-consecutive stages. These companies incorporate from specific profiles of the aforementioned professionals to a wide variety of them in the same company. These last companies will be more difficult to provide with specific packs as it will depend on the area of professionals within the company they are targeting or the stages they are involved in. On the other hand, there will be companies that are only involved in the initial phases of the project, such as planning, but need to have professional profiles with global knowledge to deal with all the subsequent stages that have

[10] As a task base in PROF/TRAC project, work fields and corresponding reference professions were described, to facilitate a transparent and harmonized understanding.
http://proftrac.eu/nzeb-skills-and-qualification-scheme/overview.html

to be designed even if their companies are not directly involved in them. Such packs will have to be more comprehensive and cover all building stages in a general way.

The possible SMEs detected, according to the professionals involved, have also been divided into white-collar and blue-collar companies. They are further separated into two subcategories which are general, meaning global, wide vision of more than one stage or topic, related with all or more than one processes of the building and; specialists, in need of specific and much more concrete knowledge on a given topic. They can be observed in the table below.

PROFILE		PLAN	PROCURE	CONSTRUCT	OPERATE	EoSL
White-collar	GENERAL	Architecture/public works/technical architecture or interior design offices			Architecture/public works/technical architecture or interior design offices	
			Building company			
		Real state investor-Building promoter			Real state investor-Building promoter	
		Urban planning offices				
	SPECIALISTS		Materials companies/ producers			
			Industrial intermediaries suppliers / distributors			
			Insurance providers			
			Housing software companies			
		Landscape offices				
		Sustaintable consulting or engineering (including specialists in energy, materials, LCA)			Sustaintable consulting or engineering (including specialists in energy, materials, LCA)	
		Engineering office			Engineering office	
		Specialist architects' offices: façadists, structural engineers				
		3D makers office				
Blue-collar	GENERAL				Maintenance company	
			Building company			
	SPECIALISTS					Demolition companies *(*usually building companies)*
						Waste management companies
						Waste treatment and recycling companies
			Electrical installation company			
			Water installation company			
			HVAC installation company			
			RE installations company			
			Companies specialised in specific material systems			
				Masonry company		
				Carpenter (wood) company		
				Specific professions (welder, plasterer, gardener) company		

We can also observe that *bluecollar* workers tend to have more specialized companies and professions, making it easier to provide them with subject-specific training packages. This makes it interesting to design more direct, effective and therefore shorter packs, rather than a single broad and general pack with knowledge less detailed for these types of workers. Still, as these are practical professions, the fact that it is specific/shorter will not make it cheaper by having to include workshops. The same happens in other companies where

whitecollar workers, like initial sustainability consultants. They need specific content of circularity and less information in topics of energy or bio-based materials, in which they already have a high level of knowledge. For this reason, it also seems interesting to combine more specific, short and detailed packages with one general training pack, which covers almost all stages and allows a more global/wide vision of all keys of the circular economy in construction. This FTP understands that a shared knowledge base among all trades/professions, a cross-craft understanding, is required.

That is to say, instead of making one training pack in 8 languages, 8 different packs will be made with at least the common introductory module in common in all of them. It would be desirable to develop at least one different pack based on modules from each of the 4 training plans that have been designed as an example in this report. The languages will have to be redistributed according to the specialization of the partner that develops the pack. However, the introductory module is provided in all languages of participating countries.

Other white-collar workers who may be in a specialized independent firm or within large architectural firms, such as façade engineers, structural or building installation engineers, and other companies like material suppliers or distributors, also have the condition of more concrete competences about their specialization. But, in this case, as they are in the Plan and Procure stages, no specific packages will be made for these profiles. It is then proposed to adapt the general pack that covers all stages and concepts in a general way towards the particular needs of these profiles, choosing only the modules and stages that are needed in the company. Other conditions may be time and investment possible for the company. Therefore, the pack will be designed to be flexible and independent per module, block (materials, waste, energy or water) or stage. Although the modules can be completed independently of each other, some modules will be indicated as essential for some profiles and it is highly recommended not to do without them. Also, one common introductory module about the 8 key elements of circular economy in construction will be mandatory in each pack designed, since it is needed in the sector a shared basic level of knowledge (e.g. common understanding of the terminology).

The building companies are shown in both profiles of workers as they have inside a wide range of different profiles: manual jobs workers, supervisors, administrative, technical architects, etc. and the training plans will have to be adapted by each company depending on the profiles they want to upskill inside it (if there is not a pack already developed in the BGC project).

3.2. Target groups and initial conclusions

As we concluded before, there is a need for some specific pack plans in some particular types of SMEs, overall, in more practical jobs; but there is always a need for a global vision introduction to circularity. So, one general plan will be developed for all planning stages (Plan to EoSL) and whitecollar profiles, with basic information and the main tips to get started and stimulate curiosity, possibilities and first thoughts of circular construction mainly covered with examples and case study in video or short presentation format. It is intended for knowledge in level EQF 3. This plan will have one module of introduction to circularity and will be a common module to all the packs proposed for both whitecollars and bluecollars. Two further training plans will be developed, required for more practical work for blue collar profiles and a final one for Plan/Procure/EoSL focusing on deconstruction, waste management and water management, as this is the main different topic of the circular framework (energy is more developed nowadays in other frameworks). Equally, the whole BGC framework will be developed in more detail and depth in the pack based on the TP4. It is aimed at profiles that want to focus on circularity, such as environmental consultants with less knowledge on materials, waste or water and is essential to develop circular thinking in waste managers and material suppliers. In this last plan, the expected level of knowledge for the pack is EQF 4/5. The synthesis is shown in the following table:

TRAINING PLAN PROPOSAL (TP)		STAGES	PROFILE		FUTURE PACKS based on TP
TP1	STARTING CIRCULARITY	Plan and Procure	White-collar	GENERAL	FTP (at least 2 and 1 for EU level)
TP2	CONSTRUCTION WORKS IN CIRCULARITY	Construct	Blue-collar	SPECIALISTS	FTP (at least 1)
TP3	CIRCULARITY IN INSTALLLATIONS	Construct and Operate			FTP (at least 1)
TP4	ADVANCING CIRCULARITY	Plan, Procure and EoSL	White-collar & Blue-collar	All	FTP (at least 1)
Minium module of all TP	INTRODUCTION TO CIRCULAR ECONOMY IN CONSTRUCTION	All	White-collar & Blue-collar	All	All FTP

**All TPs will have the possibility to be divided into FTPs of shorter duration, selecting the required modules; and will be tailored to country specific needs.*

The Introduction to circular economy in construction will be the common module at the start of each pack, for low skills participants and beginners, to acquire main concepts and definitions of circularity. The TP1 Starting Circularity will cover mainly the stages Plan and Procure (very little of EoSL) in basic concepts and theoric skills for beginners or low level in

circular construction of whitecollars profiles. Instead, the TP2 Construction works in circularity will cover only the stage of Construct (and tangentially EoSL) for bluecollar of low level in circular construction but moderate-high level in construction skills. The competences acquired will be more practical and the material provided will be graphical. Also the TP3 Circularity in installations will contain practical knowledge but will also cover Operate stage as the HVAC installers SMEs normally include management or maintenance in some cases. It will be useful also for maintenance companies. Finally, TP4 Advancing circularity will focus on EoSL, Procure and Plan and will be for both profiles. An intermediate starting level in circular construction and a moderate level in sustainability will be required to be able to carry it out. The knowledge acquired will be to understand the issue in a more specialized way. Pack that will be developed based on this last training plan will not be very interesting for manual profiles such as installers or workers on site but maybe for managers in related companies.

To upskill SMEs workers to a higher level, workers will have to take a course specialized and complete in circular construction, preferably within the framework of the BUS GoCircular project. Is not the target of this task, create elevated knowledge packs to SMEs but fundamentals. For these courses, it can be looked for the entities that have participated in the BGC Train the Trainer events and deliver courses from these trainings[11].

4. Learning methods and Training methodologies

4.1 Methodology of how the SME detect the right FTP

The methodology consists in analyzing the current competencies and skills of the specific company and detecting the right FTP for that company according to its initial levels. Understanding and defining the training requirements is the first step in finding the learning methods that best suit the particular SME. The idea is that the manager of the company that detects and wants to implement the knowledge and skills of circularity in its workers, manages this process of searching for the ideal FTP. There are two ways to proceed in order

[11] Based in the programme design in the report “Design of Programme for Training of Trainers”, https://busgocircular.eu/results/

to find the pack that the SME employees need. Once the pack is performed, the initial gaps will be overcome and maybe new needs of the SME will be discovered.

“How to upskill my SME?”

Recommendable: by the App

Step1: Sign up in the existing BUILD UP Skills advisor-app

Step2: Take the test of SMEs current skills

Step3: Find out the displayed result of the app about the current skill level and the link to the right Training Pack for the SME (and the corresponding material, learning courses also linked there) to improve them.

Step 4: Realize the Training Pack proposed

Step 5: If it is needed to further improve the workers skills or needed more specific knowledge on any subject, repeat the test and find other courses currently in progress to specialize the SME.

Another option: manual, by the SME profile

Step1: Look for the SME profile in the table in the Annex II[12]

Step2: Find out the right FTP needed and download from BGC website link

Step3: Adapt the pack to the specific demands of SME, if needed

Step 4: Realize the Training Pack proposed

After the matches between SME and right FTP will be detected, a link to the pack will be provided to the SME via the BGC project website. Inside the FTP will be materials for each content linked there.

[12] This table will be further developed with FTP linked in the report “BUS-GoCircular training packs report”. For downloading in https://busgocircular.eu/results/

4.2 Learning methods and training methodologies

There are a variety of learning approaches today, which we have classified into three main methods: digital, face-to-face education and hybrid. Each category contains different learning methodologies of which we have identified, after analyzing the main advantages and disadvantages of each, the most suitable for the profiles considered, the freely available materials and the type of pack, so that they are attractive and innovative for companies.

All TPs designed have combined the three methods resulting in future hybrid training packs. General pack Starting Circularity, due to its intrinsic characteristics of entry-level content and less practical profiles, has been more economical and has included more digital methodologies and materials. In installation and construction workers packs, on the other hand, digital and face-to-face methodologies have been combined and, in the Advancing Circularity pack, hybrid methodologies have been included due to the need for specific knowledge with a tutor (difficult in an autonomous way). Despite having a face-to-face part in some of the TP modules, we have always taken short and dynamic methods to make the packs more attractive.

4.2.1 Digital

In recent years, new learning methods have been established in society through digital tools, often due to the lack of time and difficulty of displacement, conciliation with work and family, the increasing need for immediacy, attention capture and reduction of time in acquiring basic knowledge, and a social demand for interactive, proactive and dynamic methods different from the tools used until now. For this reason, it is considered essential to incorporate digital learning methods in the proposed packs. Moreover, these methods are generally cheaper, faster and more effective for certain age and professional profiles and, due to the characteristics of some of them, more flexible. Digital methods also offer the possibility of being synchronous, asynchronous or B-Learning (virtual classroom - face-to-face). The asynchronous possibility is what allows packs to be attractive, free and accessible at any date or time and will be considered. Synchronous possibilities are not dismissed for certain knowledge or activities that require it within the company, but it will only be considered as an extra possibility, in group activities. B-learning is discarded in this case.

Digital methods proposed

Two digital methods are proposed for the configuration of training packs for SMEs, the *information pills* and the Microlearning Open Online Course (similar MOOCs but shorter),

which combine four main digital learning methodologies: microlearning (problem-solving), project-based learning, gamification and classical learning. The formats considered have depended on the material found and its content. It includes multiple formats such as videos, podcasts, written presentations, scientific articles, guides and manuals, webinars, gamification and contests. All the digital methodologies proposed will be carried out individually.

Advantages and disadvantages

The interesting advantages of all digital methodologies are:

- Flexibility
- Asynchronous. No need for all workers to coincide in time.
- Always available
- Dynamic and proactive that makes it more attractive
- Usually more economical
- No direct feedback or option for asking immediate questions

Information pills (through video)

Often, the participants complain about the length and monotony of the courses, so to make the packs attractive and with a higher probability of completion, we introduce the rapid learning through video which we call *information pills.* Videos are often the fastest way to train a person. Short training videos are an excellent learning solution for people with busy work schedules. They consist of only one topic per format, per *pill*. The duration will be a maximum of 10 minutes but often 3 minutes and priority will be given to video or podcast formats. When a video is not a possibility a short written presentation/guide or the testing of online tools would also be possible. The specific advantages and disadvantages of the information pills are as follows:

Advantages	Disadvantages
● Being able to do it in small daily time reserves of each independent worker, such as during company breaks or at home ● Less time investment ● Individual format ● Easy, less effort ● Possibility to rewatch	● Topic- specific content ● Sometimes basic level ● Not interactive or proactive ● No resolution of doubts, support ● No customized options for diverse learners

● Attractive format ● Highly economical	

Microlearning Open Online Course

In the courses detected we incorporate the ones with microlearning (problem-solving), some project-based learning and gamification and less classical learning. The main idea of the MOOCs selected to be incorporated into the FTP is that they relate theoretical concepts to existing case studies and real-life examples and are not limited to the presentation of the facts. They consist of existent online courses that are divided into very short segments using digital tools with which the student is familiar with. They are simplified and the duration is around 5-10 minutes per challenge, and around 40 min per e-learning block. The format is mainly digital presentations with gamification and exercise and some videos can be inserted. As it is said, it would be desirable materials with study cases and real examples to be used as a learning base.

Advantages	Disadvantages
● Fun and flexible ● Quick and easy access ● High degree of interaction and motivation ● Some support in digital community ● Economical ● Individual format	● Simplified content ● No customized options for diverse learners ● More on theoretical knowledge, at more initial levels with a need for less in-depth or specific knowledge

4.2.2 Face-to-face

In the particularity of the construction sector and specifically in the design of FTPs to implement circularity in companies, it must be considered that part of the competences and skills to be acquired are also practical. Although they can be taught in a theoretical way in most cases, most of the profiles in the bluecollar category have related eminently practical competences that cannot be avoided. Moreover, visual methods combined with touch and practical realization are one of the most efficient methods throughout history in education.

On the other hand, part of the workforce has a higher age profile, having developed with other non-digital learning methods and, although many of them are familiar with digital tools nowadays, more conventional methods such as face-to-face with physical material may be more efficient for them. It is necessary to know how to detect them according to companies

and also to take them into account in order to provide some activities in which they feel more comfortable; despite the fact that this type of learning is probably more expensive, longer and less flexible and therefore less attractive for the needs of SMEs.

Face-to-face methods proposed

It is suggested to avoid the traditional face-to-face courses and promote shorter and proactive methods. First, the proposal is short presentations or demonstrations of circular products or materials by the manufacturers or distributors of the materials themselves. It can be assimilated to the digital *information pills* but in a face-to-face format. Also practical workshops and internal SME contests are proposed. In these methods, workers must make an effort and make proposals, not just receive content. Finally, building visits (on-site training) are recommended to ensure that the knowledge is visually and practically imprinted on the workers in the long term. All the face-to-face methodologies will be in groups and three of them are based on project based learning.

Advantages and disadvantages

Advantages	Disadvantages
● Higher level ● Possibility of resolving doubt in time and support ● Practical knowledge ● Social interaction and teamwork ● Proactive ● Customized options for diverse learners ● Real examples	● More time invested ● Need of specialist lead ● Need of space and logistics ● Some money inversion

Workshop - practical

Workshops are intensive courses, which are attended in order to develop a specific skill quickly and directly, which is why they usually require a specialist in the area to conduct them. Workshops are usually dynamic, with knowledge applied to solve a specific problem and encourage participation, teamwork and the active attitude of the attendees, although they usually have a previous theoretical or lecture part. This distinguishes them from seminars or conferences. They are short events (4 hours maximum) and sporadic, so that they involve intensive work that interferes as little as possible with the operation of the company.

Practical workshops would be considered more essential in practical professions and not avoidable as it is the more efficient way to upskill the workforce. Although it is a face-to-face methodology, one of the most attractive and motivating of them is chosen.It is more lengthy than the digital methodologies chosen, but since it is mostly practical, turns out to be dynamic and not monotonous. Practical knowledge tends to be retained in the long term, since it follows the premise: “Tell me and I will forget, show me and I may remember; involve me and I will understand.”[13]

The contents and methodology are explained in 5.2.4 Workshop methodology. The duration will be a maximum of 4 hours (e.g. one morning), and a guide will be delivered to participants. The specific advantages and disadvantages of the practical workshops are proactive activities, practical knowledge, deeper understanding but more logistics, time and money investment than digital ones or than small demonstrations.

Workshop - SME internal contest

In this case, the workshop can be practical or more conceptual, but the idea is also that knowledge is applied to solve a specific problem of the SME in a circular topic and to encourage participation and teamwork as the previous workshop but with a competitive component. These workshops consist of organizing an internal competition in the company within the same department, in which an idea or problem is proposed and has to be solved in different groups previously formed. The workers will compete among themselves, under certain conditions and stipulated time, for the best proposal. Subsequently, the results will be explained and evaluated by giving justifications to the teams. An example could be how to implement circularity in the company or compete to develop the idea of a project, product or process that incorporates circularity ideas.

Some of these workshops could be used to carry out necessary actions in the company with the chosen proposals and in this way to cover two needs; so as not to result in the most expensive workshop of all. This is because of the need for some expert personnel to evaluate these proposals and the time invested by the workers. The idea to make the workshop cheaper is that the duration should not exceed one morning and it should be treated more like a brainstorming, with short resolution of problems and with correction among all attendees plus a single instructor. It is detailed in 5.2.4 Workshop methodology.

[13] Confucius quote.

Short presentation/demonstration of circular products or materials

Some profiles prefer face-to-face methods to acquire knowledge as more aged participants or workers of practical jobs like installers. These short demonstrations are not monotonous like long training courses but more money and logistics are required than digital methods. The idea is also to introduce rapid learning, but instead of videos, with real products or materials from material suppliers that promote circularity. As the digital *information pills* but face to face, “touching knowledge”. It consists of a visit from a supplier of materials or circular products who will give a free demonstration and explanation of their product, if possible with real examples and samples to touch, in exchange for the publicity they get for their product. At the end of the session, doubts can be resolved and some product manuals can be obtained. The duration will be a maximum of 30 minutes with 15 minutes of questions. Formats will be real samples and oral/visual presentations.

The idea of a masterclass of one circular topic of the pack is discarded.

Visit a case study and Visit a case study with "detective game"

This training methodology will be incorporated as a reward and indirect evaluation and it is also explained in 5.2.5 Evaluation. Even if it is highly recommended, it wouldn’t be required. It consists in visiting a case study, mostly buildings or facilities, detected in the SME’s city or surroundings that is interesting to consolidate the knowledge of a part of the module content. These visits could be simply tour visits, or visits in which a series of ”detective games" are proposed.

To spot a case study, it could be used a case study proposed in the available material linked in the FTP, if there is one in the SME’s city, or it could be searched in the list that will be provided at the end of the FTP. If there is no example nearby, it will be proposed to search in specialized magazines or on the web. Priority should be given to local examples. As a last and less desirable option, it could be used conventional examples made by the company itself and carry out the activity with the intention of detecting all the errors in circularity and propose improvements.

As an example of the activity structure and timing, could be:

- Previous explanation and tour of the building with the highlighted topics and on-site training, 45 minutes.

- Detective game activity: search the answer to some questions by touring the building, focusing on details and answering by taking photos (like a gymkhana), 30 minutes. This serves as indirect evaluation for the tutor of the visit.
- Free time, 15 minutes.

A time limit is fixed, in the example 30 min, and whoever gets the correct answers first, wins this activity. The maximum duration would be 1:30 hours not including travel to the site. The idea is uploading the discoveries of answers of the “game” to the BUILD UP Skills advisor-app and, once finished, the workers (winners or not of each track) as incentive and to expand the community of workers in circularity. To reduce the cost of this activity, they can be buildings or facilities built by the company itself in some of the stages of construction. Usually, training related to the specific site on which the blue-collars are working currently, are the most efficient and desired sites.

In case of coinciding a digital *information pill* of the module with one case study in the company's location, it is preferable to develop the “detective game” visit directly after having seen or read the *information pill*. Thus increasing the free time of visit and excluding the visit tour or reducing the time inverted. As a last option, although less proactive and with no evaluation criteria, is to make a programmed and explained visit to the building, excluding the second activity, the “detective game”.

In the future, once the packs have been implemented in the SME, it can be proposed that those trained in FTP and previous visits of the SME, show and lead the activity and develop what has been acquired, thus maybe reducing costs and promoting teamwork.

4.2.3 Hybrid

In the hybrid learning method, it takes advantage of both methodologies, combining their advantages to cover the disadvantages. Conventional face-to-face training allows interaction between workers and their trainer, while digital learning provides flexible online training and is more affordable. What differentiates this type of hybrid training approach is the diversity of learning content and learning methods. If it is possible in the company due to time, budget, need or predisposition, this methodology is usually recommended. As already mentioned at the beginning, all designed TPs have combined both methods resulting in more or less future hybrid training packs.

Hybrid methods proposed

In addition to the FTPs per se, as a hybrid method in an activity we suggest combining *information pills* with a subsequent discussion between other SME participants and an expert on the subject. The debate will consist of resolving doubts and asking questions to the participants as a group evaluation. The other proposed methodology has been explained in the 5.2.2 Face-to-face chapter, being the “detective game” visit after the viewing or reading of the material of this specific case study to visit. Finally, an optional trivia quiz is suggested.

Advantages and disadvantages

This method, by combining both methodologies, presents several obvious advantages over the separate methods: faster knowledge, less time invested, certain flexibility in the digital part while encouraging discussion, the doubts that may arise with an expert are resolved in a more comprehensive way, networks of help and social interaction are created and there is awareness of the acquisition of a common knowledge among peers, being even a way to evaluate the group (as a book club in which you can see who read the book and understood it).

Optional: *Information pills* (video) + discussion with an expert

This methodology will only be suggested for the ADVANCING CIRCULARITY pack which is intended to be a pack to acquire a higher level of competencies and more autonomy in skills than the others, so an expert will be needed to support and corroborate the knowledge of the participants. Short training videos are an excellent learning solution for people with busy work schedules but some support is sometimes needed. The duration of the *information pills* is already defined and the duration of the discussion is not predefined depending on the budget, questions of the participants and number of participants, not exceeding 1 hour will be ideal for 30 minutes of discussion and 30 minutes of questions-evaluation.

Optional: Trivia quizzes

This is an optional activity for indirect evaluation and corroborate knowledge of the group of participants, after a module has been implemented by everybody. The winning team could receive some prizes to motivate them. It is a group activity and some space and extra materials and time will be needed as in the Workshop - SME internal contest but in this case, the expert doesn’t have to be in the activity. Some examples can be: create a trivial of

circularity, role plays like playing circular consultants and propose solutions in selected buildings or look for materials with certain certifications. The duration will be depending on the group and manager of the SME and it is very open. When trivia questions are defined, the duration can be determined.

In conclusion, due to these characteristics observed in each learning method, the training methodologies are more suitable and useful for some profiles and/or skills. Also we have considered the available free access online materials collected, to establish these relationship profile-skill. A summary table is shown below with the chosen methodologies explained before.

TYPE OF METHODOLOGY		AIM	SKILLS	FORMAT			DURATION	LEVEL	EVALUATION FORMAT	PROFILE			COST	COMMENTS
DIGITAL	Microlearning Online Courses	Modules (several ULO's)	Theorical and conceptual	Presentations with interactive quizes	Self lead	Individual	6-7 h	Initial-Intermediate	Quiz - gamification	White / blue collar	All stages (more Plan, Procure and EoSL)	General	Medium (one material inversion or acces to web)	Introducing case studies (real applications)
	Information pills	ULO	Theorical and conceptual	Videos	Self lead	Individual	3-10 min	Initial-Intermediate		White / blue collar	All stages	General / Specialist	Low (videos free acces already online)	More efective with case studies-applications
PRESENTIAL	Workshops - practical	Modules (several ULO's) / ULO	Practical skills	Demonstration + construct prototipe	Tutor lead / Self lead	Group	4 h	All	Practical Exercise	Blue collar	Construction and operation stage	Specialist	Elevate (materials, tutor, time: sponsors?)	They can be cheaper if they are contracted by various SME's together
	Workshop - SME internal contest	Modules (several ULO's) / ULO	Manage - Design and plan	Contest (various)	Tutor lead / Self lead	Group	4 h	Intermediate	Presentation Exercise	White / blue collar	All stages	General / Specialist	Medium (tutor, time: sponsors?)	Cheaper if already there is a specialist inside the SME
	Visits/ Visits a case study with "detective game"	Modules (several ULO's)	All	Explanation + Discover the answers in the building	Tutor lead / Self lead	Group	1:30 - 2 h	Intermediate - expert	Photos, quiz	White / blue collar	All stages	General / Specialist	Elevate (transport, tutor, time)	Lower if organised in your company buildings or without transport
	Short demonstration of circular products or materials	ULO	Design and plan	Oral and Touch Demonstration	Tutor lead	Group	45 min	All	Oral Questions	White / blue collar	Plan, procure and construction	General / Specialist	Low (publicity of material/product in exchange)	
HYBRID	Information pills (video) + discussion with an expert	ULO	Theorical and conceptual - Design and plan	Mix		Individual/ group	Videos + 1 h	All	Oral Questions	White / blue collar	Plan, procure, operate and EoSL stage	General / Specialist	Medium (expert time)	
	Digital packs + Trivial quizzes	Modules (several ULO's)	Theorical and conceptual	Mix		Group	-	All	Questions	White / blue collar	Plan, procure, operate and EoSL stage	General / Specialist	Medium (trivial, time)	Lower once the trivial quizzes are created
	Digital packs + SME's Mentoring	Modules (several ULO's)	All	Mix		Individual	-	Initial-Intermediate	-	White collar	Mainly Plan	Specialist	Low (because is digital pack)	

4.2.4 Workshop methodology

As explained, most of the developed modules of the TP are carried out individually but, at some point, group activities with workers of the company may be recommended or the realization of a necessary practical workshop (if possible for that particular SME). This type of training would be considered more essential in practical professions and not avoidable. For that, a methodology has been created for designing the workshops proposed in the following TP modules: TP2 Construction works in circularity and TP3 Circularity in installations.

In a workshop, it is usual for a single specialist to manage the event, as well as being more economical for the FTPs. The workshop usually starts with a technical explanation of the topic and then the participants are asked to carry out practical activities to encourage discussion among themselves. The participants are divided into groups and carry out the task, in which they put into practice everything they have learned. The workshop ends with an analysis of the results achieved. Before setting up a workshop, the following aspects should be defined:

- **Goal:** Predefined in the pack
- **Topic – activity:** To define by SME
- **Target audience:** Which profiles of your SMEs (age, profession, department)
- **Place:** It should take place in a space that does not hinder the experience; without sudden problems, with pre-checked facilities, where those involved can fit comfortably and, if possible, that provides a sense of warmth, trust and intimacy, to encourage participation and not make them feel exposed. Depending on the activity, the organizers should provide enough space to conduct it.
    - If it does not take place inside SME, choose a place that is well connected by public transport and clearly indicate how to get there to workers. If possible, hire a shared bus.
- **Date and time:** Decide if it will be in work time, breaks in working hours or extra time (avoid this one because it is not going to motivate the workers). If you will engage in noise-producing activities, take into account the city's regulatory schedules.
- **Structure of the event and timing:** It is estimated that the human attention span lasts about 45 continuous minutes. In that sense, the pace of attention should be maintained during its peak points and then rest should be provided, through changes of activities or tone, so as not to tire the group. A 4-hour workshop should have at

least a 30-minute break in the middle for attendees to rest mentally. In general, a workshop can be divided as in this example:

- Greet attendees or indicate a place for accreditation of attendance and provide participants with the initial material required.
- Initial opening, with a brief introduction of the mediator
- Explanation of proposed and theoretical content or practical demonstration
- Coffee break
- Practical activities and space for interaction among participants
- Coffee break
- Analysis of the results achieved by the participants, handing over of accreditation (if planned) and end of the event.
- Next days: Summary of the day will be sent to the participants by email

- **Dissemination:** If the workshop is held among several SMEs in order to reduce costs, prior dissemination among the different SMEs.
- **Necessary materials and equipment:** First you have to detect the necessary investment in your idea and the possibilities you have to develop it. Workshops proposed have a moderate to high cost.
  - **Initial materials:** It is important to have visual material that has impact, is easy to understand, and encourages concentration rather than distraction or dispersion.
  - **Material and equipment during the session:**

    -Tables and their correct distribution

    -Depending on the workshop needs: projector, internet, digital tools, laptops, pens and/or markers, paper, construction tools, machinery, construction materials, helmets, boots and gloves, certain insurance, etc.

    -Purchase of coffee, water or food necessary for the break.

- **Post event:** Try to record the event so that it remains as a sample or subsequent training, either to promote in social networks the good practices of your company, to be able to do it again with less cost in your own company or to provide examples to other companies.

  If it is not possible, send a manual to the attendees with step-by-step photos of what was done for the proposed workshop 1 and 2 and a compilation of the final proposals of the attendees for workshop 3.

- **Accredit attendees:** Those who attend a workshop should feel that they have acquired something valuable, something to put on their CVs. Insignias and diplomas are always a possibility received as reward when the whole module and workshop is completed.

Types of workshop proposed for training packs

Two types of workshops are proposed to incorporate training packs according to module and according to economic or time possibilities. Ideally, each workshop created and carried out within these packs should be uploaded to the BUILD UP Skills advisor-app[14] (and to the websites of the national partners) so that a list of examples and results can be generated and exchanged between companies, on EU-level with workshops in English. In this way, networking and proposals can be created so that each company can create a workshop that works and then exchange it between them, sharing the costs. This allows, in addition to lowering management costs, the possibility of sharing services such as materials, machinery and space between companies, making it affordable for some companies to carry out a workshop that would otherwise have been too expensive if carried out individually. This list can also include free access online workshops or paid workshops organized by other entities but suitable for the contents of the packs.

PRACTICAL

Workshop 1- Demonstration by constructing one construction technique or element that promotes circularity and practical exercise for participants. Also it can be used for the demonstration of the installation of part of HVAC systems.

Goal: Understand the construction technique, why it is considered a circular solution and the knowledge needed to build it and, if applicable, to disassemble it.

Time approximation: 3-4 hours (it will depend on the construction technique)

Schedule proposed:

- Welcome attendees and make them confirm the assistance. Provide participants with the initial material required (distribution of safety equipment, if not provided by each worker: boots, helmets, gloves. If the work is carried out at height or with materials

[14] The option of uploading and downloading workshops from the BUILD UP Skills advisor-app will be possible on EU-level for an English language and for workshops that are done regularly. On a national level, it will only be possible if a country is implementing the BUS-app and formally publishes the workshops.

that specify it, it may be necessary to be covered by occupational safety insurance.) and make groups of people balanced: 15 min

- Introduction of the instructor: 10 min
- Explanation of theoretical content by instructor: the history and characteristics of the technique, which strategies make this technique circular and/or barriers of that technique: 20 min (The content can be simply presented or by asking questions to the participants to promote proactive attitude)
- Practical demonstration building a sample of the constructive element by the instructor. Main instructions of the possible tools and machinery needed: 45 min (This practical demonstration can be mixed with the theoretical at the same time) (A responsible person should be assigned to take photos of the session for the guide)
- Break: 30 min (while the instructor distribute the materials and equipments ready for each group formed)
- Division of the groups. Each group of participants must build a sample of the construction technique previously learnt and constructed by the instructor: 1:15 min (while the instructor is going around the groups resolving doubts and detecting mistakes)
- The results of all groups are shown to the rest and the instructor explains the best ones, why they are selected and the errors detected during the process in order to serve the whole group: 30 min (the responsible person, takes photos of the results and teams to promote in SME’s Instagram profile and upload to BUILD UP Skills advisor-app).
- Handing over of accreditation (if planned). The safety equipment is returned to the instructor and the materials are cleaned and stored in the indicated place by the participants: 15 min. End of the event.

Group: It is recommended in maximum 3 ppl/group, if the material available and number of participants allows it.

Place: open, large, unobstructed space, shaded if it is summer, where noise is allowed, and easy to clean. Also, accessible by public transport.

Material and equipment during the session:

For assistants and demonstration: construction tools, machinery, construction materials of the construction technique or the installation, helmets, boots and gloves, certain insurance, space for washing tools and hands, etc. Drinking water for participants and instructor.

Evaluation: The correct completion of the construction of the construction technique and participation in the questions asked throughout the session by the trainer. It is a “yes” or “no” evaluation.

Investment: In materials and equipment, instructor, maybe mobility or insurance, coffee breaks and accreditation (if planned); relatively high costs associated.

Post event: In the next few days, send a summary of the day to participants by email with a guide of photographs and steps of what was built and how; add the link of the publication in social media or the app.

Accredit attendees: Possibility of offering an accreditation of the workshop or an insignia. In the future, possibility of an examination for related micro-credentials.

In case some microcredential will be linked and available for this technique, like the project BUS League, an exam could be planned after the workshop but the fact that it would be individual, would increase the time in excess for the SME.

CONTEST

> **Workshop 2**- As in an internal company competition, a problem related to the corresponding circularity module is presented and it is proposed to be solved by groups, the results being presented at the end of the activity with a quick presentation. It is similar to brainstorming but competing with limited time and organizing the final proposal.

Goal: How to implement circularity in the company (mainly from your job position in the SME, planning the cost of it, examples where is done, etc)) / Incorporate circularity ideas of this module and improve a project, product or process (of the company or not)

Time approximation: 2- 2:30 hours (if the problem is short, time would be 1 hour)

Schedule proposed: It is proposed to solve one problem but can be shorter problems and resolutions and so, the time can be shared between two shorter problems.

- Welcome attendees and ask them to confirm their attendance. Provide participants with the initial material required (pens or markers, paper or computer/tablets, post-it, boards, documentation printed with the goal and basis of the contest) and make groups of people balanced: 15 min
- Introduction of the facilitator: 5 min

- Statement of the question to be solved by facilitator and some initial information needed to understand the task like the characteristics of the project or SME or product, main instructions, etc.: 15 min (The content can be only oral but visual support is recommended)
- Time to develop the work by the participants in groups, without the support of the facilitator. The facilitator can be asked questions about the understanding of the task, but not about the solution: max. 45 min (the time in this case depends very much on the problem to be addressed)
- Break: 15 min (while the instructor incorporates all the presentations to the main computer or collect the material created and establishes the order of the groups presentation)
- Each group does the presentation (max 5 min/presentation): total time will depend on the number of groups, try not to exceed 30 min.
- The facilitator congratulates the groups and chooses the best proposal explaining the reasons and "corrects" misconceptions: 15 min. Also, the facilitator collects or takes photos of the material produced to elaborate a document with the results of the participants. Photo teams are taken to upload in SME’s Instagram profile.
- Handing over accreditation of assistance (if planned). The materials are returned: 10 min. End of the event.

Place: Close space is recommended, big enough for the participants to be able to talk in groups at a certain distance, with internet connection and mobile chairs, with boards or screen projectors.

Material and equipment during the session: Projector, internet, digital tools, laptops, pens and/or markers, paper, etc.

Tables and their correct distribution: We recommend a U-shaped distribution for presentations and discussions and round tables distributed around the classroom for the group activity.

Evaluation: The completion and right concepts of the proposal presented. It is a “yes” or “no” evaluation.

Investment: In materials printed for the participants, maybe some other materials, facilitator, coffee breaks and accreditation (if planned); moderate costs associated.

Post event: In the next few days, send a summary of the proposals of participants by email with photographs, teams and premise raised. Link the publication in social media of the SME with BUS GoCircular Logo, if deemed appropriate.

Accredit attendees: Possibility of offering an accreditation of the workshop or an insignia. In the future, possibility of an examination for related micro-credentials.

4.2.5 Evaluation

There will be an evaluation with a qualitative methodological approach, not quantitative, as the intention is to implement competences and skills of the company so, at first, no certificates will be awarded. In the future, it would be interesting to relate the FTP's modules to existing EQF levels and micro-credentials. The diagnostic assessment part is considered before the start of the pack, if the enrollment and initial skills test is done in the application BUILD UP Skills advisor-app.

The digital training will not have a direct evaluation, assuming that the student does it with motivation and finds it interesting. In some free access online microlearning (common introductory module in each pack), however, certain activities may be required to complete the module and develop particular activities as learning evaluation for the worker. These will indicate to the worker himself/herself, the progress achieved or the possibility of winning some prizes. In the free access online materials where these exercises are not proposed, the module will end with a visit to a building with a “detective game” that will make it possible to evaluate the participants orally (indirectly and not numerically); always in acquired knowledge or not. Instead, in the practical and competition workshops there will be a formative and continuous evaluation with a final group sharing, to evaluate what has been learnt and to reinforce those aspects that have not been sufficiently assimilated. This is because the tutor-led face-to-face format makes this assessment possible.

If it is deemed appropriate or necessary in the internal training programme of the SME or if there is a lack of motivation on behalf of the workers, it is possible to consider the evaluation of the acquired knowledge with gamification. The common introductory module of each pack already incorporates this strategy inside the online materials proposed. Gamification is one of the most effective learning methodologies in training by adding certain game elements and principles to a training module, without losing sight of the training objective. The implementation of prizes and insignia for progress, incorporating a ranking system, points or challenges for correctly answered questions, setting time limits for answering quizzes or

activities are some applicable examples of both evaluation and motivation to carry out these TPs in a more attractive way for the SME. Here also it would be used to indirectly evaluate whether or not the pack has been minimally followed by the workers.

The following route is proposed within the TP. When free visit to a building is indicated at the end of the module, it refers to visiting an exemplary building detected in the SME city or surroundings that is interesting for that knowledge or that is included in a case study of the pack. In this visit, a series of "detective games" will be proposed. Some examples will be shown in the corresponding pack for various cities. Normally, these proposed visits to exemplary building or related products are group activities that come from a group achievement, i.e. they come as a reward for the whole group having completed a certain module. It would be an interesting idea for these "games" to upload the discoveries of the building and the workers (winners or not of each track), to a Learning Management Systems or other platforms/ social network in order to expand the community of workers with circularity competences, the visibility among them and the activities that can be done. It is interesting to identify the right platform for each country. In some countries, there are existing platforms suitable for this and this idea can be explored.

When insignia or rewards from the company are indicated, the company according to its capacity or interest can propose paid short courses of specific training for that module, achievement insignia for the worker or ranking published in company news, appear on the company's Instagram profile, etc. without relating it directly to economic prizes or rewards not related directly with the module. This is not the intention of gamification, but rather the recognition and creation of an engaging and fun experience that makes the user want to return. The insignias or rewards will be options for the individuals who reach the target first, unless the pack is being carried out in several departments of the company and the aim is to encourage the rewarding of a certain department. In that case, it may be interesting to include a "serious game" methodology in which a game is played directly with points for each team based on trivia-type questions or demonstrations. Also, it could be implemented that if some individual gets a certain number of insignias, gets a bigger reward.

These gamification proposals for each module are incorporated in the training plan examples designed with those that would be recommended, in Appendix 1: Index of contents of TP1, TP2, TP3 and TP4.

5. Packs and Index of Content

In order to prepare a pack design, it is necessary to reflect on the key elements: who, what, how, which materials and duration. The” who” and “how” questions and the duration have been analyzed in the previous sections of profiles and methodology. Now the “what” question will be answered, developing the index of contents of the training plans (and future packs) based on the Circular construction skills qualification framework[15]. The training plans (and future packs) are divided into stages of the construction that the particular pack is involved in: Plan, Procure, Construction, Operate and/or EoSL. Then, it is divided into the three main resources or flows to which it relates: Materials & waste, energy and water. Within that distribution, the plan is organized in modules of different circular strategies in construction. The module is the minimum measure of division of the TP, the module cannot be divided. Inside each module, the contents to be developed for the acquisition of the module are defined. When designing the corresponding FTP, these contents of the chosen modules to be developed should be linked to the available materials found (desirable) or new ones should be created. Some contents will be related to activities, therefore, the proposed activity must be contracted and designed.

The idea is that these training plans would also have the possibility to be divided into FTPs of shorter duration, selecting the required modules and be tailored to country specific needs. For that, there is no sequence of the order of the modules (even though they are organized in numbers depending on the stage of the construction and the resource/flow to which it relates), there is only an order to follow inside the modules. The exception is the common introductory module that is the first one to be implemented in all FTP. The other ones are possible to select only some of them or even to not implement; as the minimum separation unit is the module itself. Although, some modules will be indicated as essential for some profiles and it is highly recommended not to do without them. The common introductory module about the 8 key elements of circular economy in construction will be mandatory in each pack designed, since it is needed in the sector a shared basic level of knowledge (e.g. common understanding of the terminology).

Also, some visits can be changed by case studies in video format or similar, if there is not enough investment to develop in the SMEs. The FTP ends up being very adaptable by

[15] To know more about the framework developed in BGC project, download the report: “Circular construction skills qualification framework” from https://busgocircular.eu/circular-construction-skills-qualification-framework/

profession and even initial skills (starting circularity versus advancing circularity). The last pack can be considered as the fundamental pack adaptable for almost all professions except for construction or installation workers on- site; and the first one, the simplest pack, for starting in the main concepts about circular construction.

The four training plans proposals are included in the Appendix 1: Index of contents of TP1, TP2, TP3 and TP4. The contents are related to the methodology, cost and the time expected for each one, depending on the initial material found and on the one which is expected to be created. The common organization structure and iconography for all the TP designed will be the following:

	TP TITLE	TP number		Total duration (hours)		
Essential profiles	Contents	Format for contents	Training methodology *(from report)*	Minium Time	Cost aprox.	Progress/ evaluation
All	COMMON MODULE					
	Module 1. INTRODUCTION TO CIRCULAR ECONOMY IN CONSTRUCTION			hours	€	
	Key principles of circular economy			hours	€	
	Main strategies and flows in circular construction			hours	€	
	STAGE					
	MATERIALS & WASTE			hours	€	
	Module 2. TITLE MODULE			hours	€	
						*
G1	Module 3. TITLE MODULE			hours	€	
	ENERGY			hours	€	
	Module 4. TITLE MODULE			hours	€	
	WATER			hours	€	*
G3	Module 5. TITLE MODULE			hours	€	

ICONOGRAPHY	
G1	Indicator that it is a essential module for a certain profile
€	Range of expected module cost, with range from €, very low to €€€, higher cost
	Individual insignia / rewards when the module is finished
	Conducted visit to a case study (groupal)
	Visit a case study with "detective game"(groupal)
	Serious game - trivial quiz
*	Optional
↑	Highly Recommended

5.1 Index of Contents

The table of contents of each four plans is shown here. The detailed TPs are shown in the Appendix 1, in the format shown at the beginning of this section. With these TPs, you will be able to create a continuous and engaging learning experience that will create stronger professional relationships, improve user engagement and boost your company's business performance.

TP1 - STARTING CIRCULARITY
❖ **COMMON MODULE**
❖ Module 1. INTRODUCTION TO CIRCULAR ECONOMY IN CONSTRUCTION
○ Key principles of circular economy
▪ Prioritise regenerative and efficient use of resources
▪ Design for the future
▪ Assemble/construct for the future
▪ Rethink the business model
▪ Stretch the lifetime
▪ Use secondary resources
▪ Incorporate digital technology
▪ Collaborate to create joint value
▪ Strengthen and advance knowledge
○ Circularity definition and different vectors
▪ Circularity definition. Materials, energy, waste and water
❖ **PLAN**
○ **MATERIALS & WASTE**
❖ Module 2. STRATEGIES OF CIRCULAR DESIGN IN MATERIALS
▪ Main strategies related with materials in circular construction
▪ 1 Case study of "circular materials" (low impact, non-critical, local, non - toxic, bio-based, prefabricated-modular system)

TP1 - STARTING CIRCULARITY *(Continuation)*

▪ 1 Case study in reuse of materials in national level if possible: close loop, high quality reuse
▪ 1 Case study of renovation (showing savings versus NB)
▪ 2 Product demonstration
▪ Mantaince plan example
▪ 1 Visit with detective game to a different case study (from list)
❖ Module 3. TOOLS TO SUPPORT CIRCULAR DESIGN IN MATERIALS
▪ How to read an EPDs
▪ 2 Cases study: two EPD's to compare (one high impact like plastic element and other low impact)
▪ Material Circularity Indicator
▪ How to read material passports and its use
▪ BIM modelling applications to building to aid circular applications
○ **ENERGY**
❖ Module 4. DESIGN TO REDUCE ENERGY DEMAND
▪ 1 example with climate consultant analisys of 2 different climates and main strategies of psychometric chart
▪ 1 Visit with detective game to a case study with cool and hot bioclimatique strategies
▪ Module 5. TOOLS TO SUPPORT ENERGY EFFICIENT DESIGN / DIGITIZATION
▪ Software for energy simplify models (National energy certifications, CE3x, etc)
▪ 1 practice with Tools such as R10 from IVE for renovation, triplea-reno to get some initial advice
○ **WATER**
❖ Module 6. DESIGN TO REDUCE WATER CONSUMPTION
▪ 1 Case study (national level) of Harvesting greywater and rainwater
▪ 1 Case study (national level) of purify water with Plant-based biofilters
▪ 1 Case study (national level) of draining pavements for public spaces or green roofs/facades
❖ Module 7. TOOLS TO SUPPORT WATER EFFICIENT DESIGN / DIGITIZATION
▪ 1 practice with tool with tips for reducing water consumption (Drive 0)
❖ **PROCURE**
○ **MATERIALS & WASTE**
❖ Module 8. BANKS AND CERTIFICATION FOR MATERIALS
▪ Green building certification systems (LEED, BREAM, DGNB, VERDE, even Level(s)): materials credits/objectives focus
▪ List of materials with Ecolabells
▪ How to read material passports
▪ How to use digital marketplaces to find or to sell (transformed) used materials
▪ Examples of marketplaces (existing online platforms or physical local stores) of reuse materials in national level
❖ Module 9. BUSINESS MODELS
▪ Strategies for providing building components as a service (e.g. installation company ensures good indoor climate and remains owner of installations)
▪ Leasing models and Rental models
▪ Options for multi-use, sharing of spaces rather than ownership
▪ 1 case study of co-housing or multi-use
▪ Buildings as a service not as a property

TP1 - STARTING CIRCULARITY *(Continuation)*

▪ Examples of European regulations requiring it (new circular economy legislation, embodied carbon for GP) and limit values
❖ **EoSL**
○ **MATERIALS & WASTE**
❖ Module 10. USE SECONDARY RESOURCES
▪ 2 case study: recycled secondary materials/components from other industry (1) and from the same (1)
▪ 1 visit to plant of best practices in transforming recycling materials (recycling aggregates for concrete)

TP2 - CONSTRUCTION WORKS IN CIRCULARITY

TP2 - CONSTRUCTION WORKS IN CIRCULARITY
❖ **COMMON MODULE**
❖ Module 1. INTRODUCTION TO CIRCULAR ECONOMY IN CONSTRUCTION
○ Key principles of circular economy
▪ Prioritise regenerative and efficient use of resources
▪ Design for the future
▪ Assemble/construct for the future
▪ Rethink the business model
▪ Stretch the lifetime
▪ Use secondary resources
▪ Incorporate digital technology
▪ Collaborate to create joint value
▪ Strengthen and advance knowledge
❖ Circularity definition and different vectors
○ Circularity definition. Materials, energy, waste and water
❖ **CONSTRUCT**
○ **MATERIALS & WASTE**
▪ Main strategies related with materials in circular construction
❖ Module 2. BUILD TO CLOSE THE LOOP OF MATERIALS
▪ How to build in wood (different systems: CLT, laminated beams and colums, ballon frame)
▪ National regulation requirements in wood structures (fire, acoustics, resistance, another limitation)
▪ 1 tutorial video in wood structure construction
▪ 1 workshop to choose: straw bricks, rammed earth, bio "concrete"(hemp), green roof or facade
▪ How to mix recycled aggregates in concrete
▪ National/EU regulations of recycled concretes
▪ How to build with biobased isolation
▪ National regulation requirements with bio-based materials (fire, acoustics, resistance, exposition)
▪ 2 workshops to choose: recycled aggregates in concrete or mortar, recycled cotton isolation, wood fiber isolation, cellulose or wool sheep insuflation, cork exterior isolation, some of these isolation in ETICS systems
▪ 4 video tutorial of the techniques no implemented in the workshop

TP2 - CONSTRUCTION WORKS IN CIRCULARITY *(Continuation)*

❖ Module 3. BUILD TO REDUCE IMPACT: LOCAL, LOW IMPACT, NON-TOXIC AND/OR NON-CRITICAL MATERIALS
▪ How to build with low impact materials (besides of bio-based) in roofs
▪ 1 tutorial video in low impact roof
▪ How to build with low impact materials (besides of bio-based) in coatings
▪ 1 workshop in low impact coatings (preference in pavement, carpets or panels, not paints or varnish)
▪ Types of coating materials that can have emissions: paints, sealants, adhesives, floors, isolations, etc.
▪ Coating materials with little to no volatile organic compound (VOC) emissions : low formaldehyde panels, COV's free paints or adhesives and sealants, low COV and formaldehyde floors, etc.
▪ How to read a secutiry material sheet or another certificates (REACH, labels of these materials, etc)
▪ 2 product demonstration of low or zero COV emitting material: clay mortars, silicate or natural paints, lasurs or oils, etc
▪ National/EU requirements or recomendation in interior material emission
▪ 1 workshop constest: how to replace at maximium plastic or concrete in a residential building and other materials proposals.
❖ Module 4. BUILD TO REDUCE WASTE IN SITE AND IN EOSL (PART1)
▪ Modular construction systems and their procedures for assembly (incl. prefabricated modules)
▪ Removable joints in general (incl. those made from non-conventional materials, sealants that allow for disassembly, ensure that connections made are accessible)
▪ Removable joints in wood
▪ Removable joints in steel
▪ 1 workshops of removable joints (in wood, steel, prefabricated systems, etc.)
▪ How to build in pre-fabricated solutions in the market (national level) in facades: Wall sandwich panel with biobased isolation, full prefabricated wood wall, exterior facades of recycled content coatings, etc
▪ 1 product demonstration of modular construction system in facades
▪ How to build with pre-fabricated solutions in interior walls/pavements: dry systems, slot systems, etc.
▪ 1 workshops of interior elements: wooden/gypsum panels with wooden substructure, fermacell type slabs, wood/bamboo click flooring, hydraulic tiles on sand, etc.
▪ 1 video tutorial of the techniques no implemented in the workshop
▪ Disassemble one of the modular structures learned before
▪ 2 workshops in dismantling and reusing materials (close loop, high quality reuse): hydraulic tiles, structure element, interior panel, window or doors, etc.
❖ Module 5. BEST PRACTICES AT THE CONSTRUCTION SITE TO REDUCE WASTE AND PROMOTE RECYCLING
▪ Highlights of waste law actions and current waste management prices (national level): sorting, %, fees, nº waste strems, etc
▪ The importance of sorting waste streams correctly at the construction site, cleaning them for their subsequent management
▪ Difficult to separate or recycle solutions or materials
▪ Optimization of materials in wet construction (pastes, binders) and reuse of leftovers at the construction site - examples

TP2 - CONSTRUCTION WORKS IN CIRCULARITY *(Continuation)*

▪ Avoid overlong on site storage of materials (protect them, well organised on site, special care with hazard waste or machinery)
▪ The importance of protecting and maintaining materials in place to extend service life (layers of differents durabilities)
❖ Module 6. DIGITIZATION
▪ How to read plans and construction details in BIM
○ **ENERGY**
❖ Module 7. INSTALL ENERGY EFFICIENCY MEASURES IN BUILDINGS: PASSIVE
▪ How to install a energy efficient window
▪ How to build correctly a passive house (focusing in airtightness)
▪ How to build ventilated controled roof
▪ Ensure continuity of insulation in building envelope and pipes
▪ How to build a trombe wall (MGRFI)
▪ How to install a sollar collectors like atriums with solar protection (MGRFI)
▪ Conduct draught-proofing in buildings
▪ 1 workshop of the before techniques
▪ 1 demonstration of airtightness test
❖ **OPERATE**
○ **MATERIALS & WASTE**
▪ Options for energy and material savings during operation
❖ Module 8. STRETCH THE LIFETIME
▪ How to realise and implement mantaince plans: mantain and repair before changing (modularity to enable exchange of parts, accessible solutions to make them repairable, etc)
▪ Maintenance plans according to material
▪ Conduct regular checks for built structures
▪ Common pathologies in exposed/non-exposed bio-based materials
▪ Preservation and management with biological products on site
▪ 1 product demonstration
▪ Periodic treatment and maintenance of wood, straw and other bio-based materials used for the building.
▪ 1 workshop of treatment with biobased materials
▪ Importance of not exposing some biobased materials
▪ Common pathologies in prefabricated elements (ventilated facades)
▪ Maintanace of green roofs/facades
❖ Module 9. RETHINK THE BUSINESS MODEL
▪ Business models of maintenance and repair services (best practices)
▪ Platform or list of SMEs that are innovative in upgrading services and maintanance
▪ 1 visit to one of the SMEs
▪ Realise DIY techniques for repair and maintenance for enabling self-repair of users
▪ 1 case study
▪ Definition of figures for the management of public buildings
❖ Module 10. DIGITIZATION
▪ BIM modelling for repair information
▪ Maintanance sheets or materials passport

TP3- CIRCULARITY IN INSTALLATIONS

TP3 - CIRCULARITY IN INSTALLATIONS
❖ **COMMON MODULE**
❖ Module 1. INTRODUCTION TO CIRCULAR ECONOMY IN CONSTRUCTION
○ Key principles of circular economy
▪ Prioritise regenerative and efficient use of resources
▪ Design for the future
▪ Assemble/construct for the future
▪ Rethink the business model
▪ Stretch the lifetime
▪ Use secondary resources
▪ Incorporate digital technology
▪ Collaborate to create joint value
▪ Strengthen and advance knowledge
❖ Circularity definition and different vectors
○ Circularity definition. Materials, energy, waste and water
❖ **CONSTRUCT**
○ ENERGY
❖ Module 2. INSTALL ENERGY EFFICIENCY MEASURES IN BUILDINGS: PASSIVE
▪ Conduct airtightness test
❖ Module 3. INSTALL ENERGY EFFICIENCY MEASURES IN BUILDINGS: ACTIVE
▪ Apply smart solutions to installations and manage correctly (termostates, timetibles)
▪ Systems and solutions that make intallations accesible to repair
▪ Sectorize installation to be adaptable to changes and reparations
▪ Energetic efficient systems that generates heat/cold (heat water pumps, underfloor heating, centralized systems versus individual, waste heat/district heating, etc.)
▪ Efficient lighting systems
▪ Regulations related to energy limitations and with regards to energy source
▪ Install underfloor heating
▪ Connection to district heating
▪ Install forced ventilation system in passive houses
▪ Install roof fans and its benefit versus airconditioning
▪ Install automatisation systems (domotics, sensors for energy management or CO2)
▪ How to install a sollar collectors like atriums with solar protection (MGRFI) with automatisation
❖ Module 4. INSTALL RENEWABLE ENERGY SYSTEMS IN BUILDINGS
▪ Types of renewable energy (types, difference of autonoums/grid connection systems, types of batteries for storage energy)
▪ Install solar panels
▪ Install PV panels in roof
▪ Install PV panels in facade
▪ Install heat pumps (aerothermia) (and with solar panel connection)
▪ Install biomass heaters /solutions
▪ Install batteries for storage energy
▪ Install another less common systems (geothermia, wind)

TP3- CIRCULARITY IN INSTALLATIONS *(Continuation)*

❖ Module 5. DIGITIZATION
▪ How to read intallations plans in BIM
▪ Software for PV calculation
▪ Use of drones for site applications: drones and imaging technologies for collecting data in construction projects
○ WATER
❖ Module 6. BUILD TO CLOSE THE LOOP OF WATER
▪ Dry toilets system
▪ How to design a greywater separation installation and it allowed/recommended applications
▪ How to build a greywater separation installation
▪ How to install a greywater treatment system in site
▪ How to install a refilling of toilet cisterns (of greywater)
▪ How to design a rainwater installation and it allowed/recommended applications
▪ How to build a rainwater installation
▪ How to install a rainwater treatment system in site
▪ How to build an irrigation system with rainwater harvesting
▪ How to build a plant-based biofilters to purify water and retorn water to the environment
▪ How to build sustainable drainage systems (urbanisation) and draining pavements for public spaces
▪ How to Build MGRFI for collecting water or self irrigation (also selection of native/adaptative plants)
❖ Module 7. DIGITIZATION
▪ How to read plans of water intallations in BIM
❖ **OPERATE**
○ ENERGY
Options for energy and material savings during operation
❖ Module 8. STRETCH THE LIFETIME
▪ Active maintenance (includ. repair) of solar panels and connections (avoid overheating, dust, ..)
▪ Active maintenance of PV panels (avoid overheating, polvo reduce efectividad,..)
▪ Active maintenance of heat pumps (aerothermia)
▪ Active maintenance of boilders
▪ active maintenance of radiators or underfloor heating
▪ active maintenance of biomass heaters
▪ active maintenance of water systems
▪ Maintenance plans according to installation
▪ Conduct regular checks for installations
▪ Create guide for building users
❖ Module 9. RETHINK THE BUSINESS MODEL
▪ Business models of maintenance and repair services (best practices)
▪ Definition of figures for the management of public buildings
❖ Module 10. DIGITIZATION
▪ BIM modelling for repair information
▪ Maintanance sheets or materials passport

TP4- ADVANCING CIRCULARITY

TP4 - ADVANCING CIRCULARITY
❖ **PLAN**
○ MATERIALS & WASTE
❖ Module 2. DESIGN TO REDUCE MATERIALS DEMAND
▪ Structure and facades with lightweight materials: accurate structural design/ industrialised prefabricated products/ of wood
▪ Non essential layers for regulatory compliance
▪ Other optimization of quantities examples
❖ Module 3. DESIGN TO CLOSE THE LOOP OF MATERIALS
▪ Types of renewable materials (bio-based) in construction
▪ Advantages and barriers of biobased materials
▪ National regulation requirements with bio-based materials
▪ Types of materials with recycled content
▪ Barriers of recycled concretes and barriers in national/EU regulations
▪ Reuse of materials in national level if possible: close loop, high quality reuse
▪ Barriers of reuse materials (regulation, assays needed, existence of suppliers, insurances, money investment)
▪ Marketplaces (digital) of reuse materials in national level
▪ Reuse of materials in national level if possible (more than gravel in foundations): open loop
❖ Module 4. DESIGN TO REDUCE WASTE IN SITE AND IN EOSL (PART1)
▪ Pre-fabricated solutions in the market (and sustainable insulation materials in prefabricated walls)
▪ Minimaze raw materials and humid construction solutions in project
▪ An appropriate waste study and plan and construction limit values
▪ Modular construction solutions (prioritise standardised solutions and systems to increase possibilities of reuse)
▪ Types of detachable unions in prefabricated concrete, steel and wood structures, facade systems (to repair by parts or reuse)
▪ Design of disassemblability plan for the building (examples of clear demolition specifications)
▪ Difficult to separate or recycle solutions or materials
❖ Module 5. DESIGN TO REDUCE WASTE IN EOSL AND TO EXTEND THE SERVICE LIFE (PART2)
▪ Durability of materials vs. adaptability of continents (layers of differents durabilities)
▪ Strategies to make flexible and adapt to changing needs of occupants (e.g. partition walls and systems, modular structure dimensions, accesible instalattions, etc)
▪ Design with materials that enable multiple uses (roofs, facades - MGRFI): type and combination (no detailed)
▪ Renovation vs. New building impact + Subsides or incentives EU or national.
▪ Importance of mantaince plans (modularity to enable exchange of parts, accessible solutions to make them repairable, etc)
▪ How to implement these strategies in your company
❖ Module 6. DESIGN TO REDUCE IMPACT: LOCAL, LOW IMPACT, NON-TOXIC AND/OR NON-CRITICAL MATERIALS
▪ Types of low impact materials (besides of bio-based) in construction and advantages of each one
▪ Local materials suppliers (national level)
▪ National grants or subsidies-EU to promote their use

TP4- ADVANCING CIRCULARITY *(Continuation)*

▪ Types of critical raw materials as defined by the EU to avoid
▪ Materials that have little to no volatile organic compound (VOC) emissions
▪ Types of non-toxic construction materials (alternatives to anti-flame retardants used on wood, low formaldehyde panels, COV's free paints, etc)
▪ Existing labels for materials (low-emitting materials, Ecolabelling)
❖ Module 7. TOOLS TO SUPPORT CIRCULAR DESIGN IN MATERIALS
▪ LCA /LCC assestment: methodology (embodied energy and carbon footprint)
▪ LCA /LCC assestment: environmental indicators
▪ LCA software examples (OneClick, TCQ, free acces)
▪ How to read an EPDs
▪ How to compare EPD's
▪ Material Circularity Indicator and limit values
▪ European regulations requiring it (new circular economy legislation, embodied carbon for GP) and limit values
▪ Green building certification systems (LEED, BREAM, DGNB, VERDE, even Level(s)): materials credits/objectives focus
▪ Environmental costing models
❖ Module 8. DIGITIZATION
▪ Software that helps design modular
▪ BIM modelling applications to building to aid circular applications
▪ Material passports example and its use
▪ 3D printing materials
○ ENERGY
❖ Module 9. DESIGN TO REDUCE ENERGY DEMAND
▪ Climates, its indicators (temperature, humity, solar radiation, cloudy days, etc) and how to read it (psychometric chart)
▪ Software to analysis and design with climate (one of: climate consultant, archiwizard, ecotect, ladybug in rhino,..)
▪ Introduction and History of Bioclimatique Buildings.
▪ Main passive design strategies for hot season: crossed ventilation, ventilation chimneys, solar protection, inertia
▪ Main passive design strategies for cold season: isolation, solar energy-inertia, solar captors to store passive energy, airtightness
▪ Type of bio-based and low impact isolations (e.g. sheep's wool, cellulose, earthwool)
▪ Airtightness test
▪ Design MGRFI focusing in solar captors, trombe wall, PV facades/roofs, etc
▪ Energy management for public buildings (programmes, profiles, savings)
▪ Private management and the importance of the housing user handbook
❖ Module 10. DESIGN TO REDUCE ENERGY CONSUMPTION
▪ Types of systems that generates power (electric operations substitutes fossil fuel, lights and electrodomestics efficiency)
▪ Efficient lights and movement sensors with save energy data
▪ Types of energetic efficient systems that generates heat/cold (heat water pumps, underfloor heating, centralized systems, waste heat/district heating, etc.)
▪ Waste heat/district heating
▪ Energy efficient stretagies with right management (temperatura de consigna, reguladores individuales, horario)

TP4- ADVANCING CIRCULARITY *(Continuation)*

▪ Energy efficient stretagies with automatisation (domotics, sensors for energy management)
▪ Regulations related to energy limitations and with regards to energy source
▪ Design sectorize and fleixble installation to be adaptable to changes and reparations
▪ How to reduce energy consumption in your company
❖ Module 11. DESIGN TO NEUTRALISE THE ENERGY CONSUMED
▪ Types of renewable energy - e.g.solar/PV panels, solar thermal collectors, aerothermia, sustainable biomass, waste water heat recovery) - examples installed
▪ Systems autonoum or connected to grid
▪ Storage of excess power (types of batteries for storing renewable electricity produced)
▪ CO2 taxes and CO2 compensation programs
❖ Module 12. TOOLS TO SUPPORT ENERGY EFFICIENT DESIGN / DIGITIZATION
▪ Software for energy models (Design Builder, National energy certifications, etc)
▪ Software as R10 IVE for renovation or CE3x, triplea-reno
▪ Software for PV calculation
▪ Software to design accurate lights
○ WATER
❖ Module 13. DESIGN TO REDUCE WATER DEMAND
▪ Existing energy-saving systems (in taps, toilets, etc.)
▪ Dry toilets system
▪ Water Efficient Use Guidelines for Users - example
▪ Choosing native and less consumptive plants
❖ Module 14. DESIGN TO REDUCE WATER CONSUMPTION
▪ Systems of Harvesting greywater and it allowed/recommended applications
▪ Systems of Harvesting rainwater and it allowed/recommended applications
▪ Systems of purify water (Plant-based biofilters, etc)
▪ Appropriate and possible uses for phreatic water (local level)
▪ Maps of water wells and aquifer reserves (local level)
▪ Regulations related to water use and systems limitations
❖ Module 15. DESIGN TO CAPTURE WATER AND HUMIDITY
▪ Sustainable drainage systems (urbanisation) and draining pavements for public spaces
▪ Design MGRFI focusing in water captors and green roofs/facades
▪ Collect and reuse of water in humid interior areas (e.g. cellars, gims)
▪ Module 16. TOOLS TO SUPPORT ENERGY EFFICIENT DESIGN / DIGITIZATION
▪ Software for water system calculations, plants irrigation
▪ BIM modelling applications to building to aid circular applications
▪ Another tool with tips for reducing water consumption (Drive 0)
❖ **PROCURE**
○ MATERIALS & WASTE
❖ Module 17. BANKS AND CERTIFICATION FOR MATERIALS
▪ Green building certification systems (LEED, BREAM, DGNB, VERDE, even Level(s)): materials credits/objectives focus
▪ Suppliers of sustainable /best practices materials (from different strategies)
▪ Resource hubs/ material banks
▪ Ecolabells

TP4- ADVANCING CIRCULARITY *(Continuation)*

▪ How to read an EPDs - example
▪ EPDs banks
▪ How to use digital marketplaces to find or to sell (transformed) used materials
▪ Marketplaces (existing online platforms or physical local stores) of reuse materials in national level
▪ Tests that enable re-use/pre audition
▪ How to read material passports
▪ Insurance and guarantees needed for reused materials
❖ Module 18. BUSINESS MODELS
▪ Strategies for providing building components as a service (e.g. installation company ensures good indoor climate and remains owner of installations)
▪ Leasing models and Rental models
▪ Options for multi-use, sharing of spaces rather than ownership- 1 case study of co-housing or multi-use
▪ Buildings as a service not as a property
▪ Strategies for promoting greater circularity in your company
▪ European regulations requiring it (new circular economy legislation, embodied carbon for GP) and limit values
❖ **EoSL**
○ MATERIALS & WASTE
❖ Module 19. ASSESSTMENT, LOGISTICS AND MARKET PLACE TO USE SECONDARY RESOURCES
▪ Adaptive reuse of existing buildings for a new purpose
▪ Assess the quality of materials to be reused (audit of waste)
▪ Maximise lifetime of products after use
▪ Disassemble modular structures
▪ Organise logistics and storage of secondary materials
▪ Organise and provide guarantees for reused materials
▪ Trade secondary materials and products on digital marketplaces
▪ Digital marketplaces
❖ Module 20. USE SECONDARY RESOURCES
▪ Reuse, repurpose or recycle secondary materials/components/resources from the same industry
▪ Reuse, repurpose or recycle secondary materials/components/resources from other industries
▪ Transform waste streams for reuse, repurpose, or recycle waste streams within the same industry (closed loop)
▪ Transform waste streams for reuse, repurpose, or recycle waste streams within other industries (open loop)
▪ Collaborate with industry peers to create joint value and identify synergies (best practices)
❖ Module 21. DIGITIZATION
▪ BIM modelling applications to building to aid circular applications

6. Free access training material for packs

In order to carry out the FTP based on the previous TPs, didactic material in accordance with the proposed table of contents and methodologies is needed. In order to reduce the costs of the FTPs and to avoid the creation of existing content, it is intended to use training materials found online with open access. This is also possible thanks to the philosophy of the Fundamental Training Packs, to train through examples and case studies in order to be a direct and attractive material for these initial levels or practical profiles. This idea also comes from the conclusions acquired after the search for online material and existing courses on circularity in report D3.1 Structural assessment of available training materials and methodologies. From there we find advice such as "Nice to have: include example scripts (text in document), and real-world applications and practical examples" and also "include baseline curriculum to be tailored to country-specific needs". If new material is needed and has to be created, funding will be sought, as explained in section 8.

Also, the creation of the packs is intended to overcome the gap in the open-source circular construction training materials that provide coverage of the basic knowledge and skills required by the circular construction workforce (in initial skills). In addition, we face the problem of dispersed, unordered or unclassified material available online. The aim is to make sense of and classify this existing material before the creation of a new one, harmonizing and standardizing it.

6.1. Actual materials vs. Real needs

Based on the available training materials found in report D3.1 Structural assessment of available training materials and methodologies, this search was increased due to the need to cover all the contents and more languages with this material. This would facilitate the creation of the FTPs in the “BUS-GoCircular training packs report”[16].

In the first search and classification of the online material available in free access, it was detected that these materials did not always correspond to the real needs of content to develop the packs (FPT). For example, we found more content on some contents than on others, as well as a lack of more dynamic formats (videos, short presentations) as regards longer formats (scientific articles, extensive guides). There is a large amount of content on energy flow and the initial digitalization module and less on water flow. On materials and waste, there are quite a significant number of case studies but fewer guides on disassembly.

[16] Report in: https://busgocircular.eu/results/

There are some contents for which no material has been found, which represents a problem in the elaboration of the packs, making it necessary to create new material or extend the search. The methodologies are almost all digital, not having found in this first search, materials to apply in workshop, trivia.quizz or “detective games”. In the second search to be conducted, it is recommended a further search on these materials or the creation of these to be carried out. Finally, we found a lot of material in English, Spanish and Dutch, compared to other languages.

The material shown in Appendix 4: Online free access materials classification, is the material available online and free access found up to the date of the development of this report. During the design of the final FTPs, this material is intended to be augmented to complete this table. In this way, this table will be a repository of available materials to help the creation of packs within the project as well as externally, by interested SMEs or Trainers who may need them. It will be an ordered and classified catalog linked to the ULO's that are implemented as shown in the table in Appendix 4, to facilitate the link with the contents of the proposed TPs. The difficulty in maintaining this "catalog" of training materials will be its updating since, for the moment, it will be a static list. This material is focused on online content to be implemented when the methodology is indicated to be digital. For the contents where the methodology is different as face-to-face, this will have to be created as mentioned before. This represents a limitation (time and money). In the following table, it can be seen an extract of the classification of the available materials found:

Language	Free acces materials TITLE	Subtask - Competences	ULO Nr.	Delivery location/type	Deliverable	Time	Level (I or II)	General/ so specific
SP	**Informe_Cotec_Economia_Circular_2021_vfinal**	Report on the current state of the circular economy in spain and europe. Long. It talks about value chain and stuff. I don't know where to put it	NO	Online / self-led	report	10 min	I	
SP	**huella-hidrica**	Apply measures that replace freshwater with less impactful alternatives	6	Online / self-led	guide	20 pages	I	general
		Enact water efficiency measures	7, 15	Online / self-led				
SP	**Guía-sostenibilidad-en-la-construcción-IVE-Residuos**	Design to reduce waste during production and use	2, 26, 27, 28	Online / self-led			I	
	Sustainable Materials Management (MOOC)			Online / self-led				
EN	Value & governance	Redefine building regulations to incentivise circular approaches in construction	80	Online / self-led	video	4 min		general
EN	The importance of networks for sharing information	Collaborate with industry peers to create joint value and identify synergies	34, 35	Online / self-led	video	7 min		general
EN	Policies for circular economy	Redefine building regulations to incentivise circular approaches in construction	80	Online / self-led	video	3 min		general
EN	'Right to repair'	Offer construction maintenance and repair services	43, 64	Online / self-led	article			
		Repair (active maintenance) existing structures and installations	15, 64	Online / self-led				
EN	List of relevant materials - Criticality of materials	Source bio-based, reusable, non-toxic and non-critical materials	3		graphic	5 min		specific
	Circular Economy for a Sustainable Built Environment (MOOC)							
EN	Overview on bio-based building material made with plant aggregate	Design with bio-based, non-toxic and/or non-critical materials	1, 2, 3, 4	Online / self-led	scientific article	10 min	II	specific

7. Future packs and possible certification

There will be eight specific packs developed in T4.4[17], one of each country participant and one pack on EU level, following this guide and based on the training plan examples proposed in this report (Appendix 1). Packs will be available online and uploaded in the BUILD UP Skills advisor-app to be easily replicable, to the BGC website and, if possible, in partners websites (national). These table will be define to developed the eight FTP:

BASED ON TRAINING PLAN (TP)		Training Pack to developed (FTP)	PARTNERS INVOLVED	LANGUAGE	SMEs	ULO's assested	MODULES	TUTOR LEAD	SELF LEAD	DURATION	EQ LEVEL	RANK OF COST
TP1	INITIAL CIRCULARITY	FTP 1 (EU level)	ACE	English	All			Hours	Hours	Hours	3	€
TP1	INITIAL CIRCULARITY	To define	To define	To define	All			Hours	Hours	Hours	3	€
TP2	CONSTRUCTION WORKS IN CIRCULARITY	To define	To define	To define	- Company specialised in specific material systems-installators - Masonry company - Carpenter (wood) company - Another specific professions (welder, plasterer, plumbers, etc) company - Maintenance company - Building company			Hours	Hours	Hours	3	€€
TP3	CIRCULARITY IN INSTALLLATIONS	To define	To define	To define	- Electrical installation company - Water systems installation company - HVAC installation company - RE installations company			Hours	Hours	Hours	3	€€
TP4	ADVANCE CIRCULARITY	To define	To define	To define	- Sustaintable consulting or engineering Architecture's office - Public management/ governance - Demolition company (or building companies) - Waste management company - Material producer - Waste treatment and recycling company			Hours	Hours	Hours	4/5	€€€

Some advice is given for developing the future Fundamental Training Packs. The steps will be the following:

- Choose the main profile you are going to focus the pack for.
- Identify in the previous table the appropriate training plan for that profile.
- Choose within this TP, the necessary or priority modules (or blocks) you are going to design for the chosen profile.
- Link the free access materials already found to the contents of that module.
- Create or search for new material adapted to your country for the contents that materials are missing; giving priority to case studies and methodologies proposed in the TP.

[17] https://busgocircular.eu/results/

- Readapt and design the rest of the activities of the module that do not correspond to digital methodology.
- Find the necessary funding to implement the pack without or with the least financial investment for the SMEs.
- It would be interesting to distribute it to some interested SMEs so that they can carry it out and serve as pilots.

In addition, it may be interesting in the design of the packs, to adapt them following the methodology established for the definition of the European Qualification framework (EQF), detecting in each module the independent level, in case they will be performed separately (analyse the existing materials and the newly created ones). In general, it is recommended to acquire EQF levels 3 for the initial packs, except for the Advance Circularity pack, which is intended to reach level 4 or 5, to be defined.

In order to increase the attractiveness of the packs to SME and provide building workers at national level with the competences and skills required in the fields of circularity, it is also proposed to consider in the design of the packs the following:

- Relate some modules but specially some practical workshops to microcredentials of projects such as BUS League or other existent certificates. In this way, while the pack, module or workshop is made to upskill circularity, accreditations are obtained for the employee and, therefore, for the company. It is extra motivation while upskilling the workforce.
- It may also be considered to create any kind of insignia or accreditation of the completion of the pack.
- Finally, another option is the inverse action: to incorporate these key competences in those current qualifications related to circularity, if national certification exists.

Finally, as an observation, a possible partial financing of some training modules for active workers (not self-employed) is explained. In Spain, through FUNDAE, which is a public state foundation, subsidised training is promoted. On the other hand, companies have to pay social service contributions to the state for their workers. Within this quota, discounts are applied if training courses paid by the company are carried out for its workers in training centers accredited to give these subsidised courses. Depending on the number of workers, the company can recover this money from the training invested, as it is subsidised by FUNDAE. This and other alternatives to possible investment can be studied. In the case of

this example, it could be considered to propose these training modules to FUNDAE, be approved by them and therefore recover part of the initial investment.

8. Validation

The proposed training plans, before creating the packs, need to be 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. A design of the validation methodology has to be implemented. This work will be developed while designing the final Fundamental Training Packs.

On the other hand, in order to develop and carry out some of the training parts of the framework and methodology proposed, such as creating material that has not been found freely available online, designing the workshops or conducting instructor-led activities, funding is needed. T4.4. will examine how to reduce the economic investment required by SMEs. Co-financing will be explored with private companies as sponsors.

Therefore, if possible, the consortium partners will hold meetings with the necessary interested SMEs (in exchange of the free TPs), professional chambers or associations in their country as well as with potential sponsors such as the producers of circularity-related materials (found in T4.3). Beforehand, in order to define these meetings and the methodology of validation, issues such as the following will be agreed between the partners:

SMEs: SMEs that will be contacted by each partner to participate

- 1.NUMBER CONDITION: Minimum number of SMEs needed by country- How many SMEs do you think will be perfect to corroborate these training packs?
- 2.TYPE CONDITION: Which profiles of SMEs do you think will be perfect to corroborate these training packs? One for each stage of the building process (Plan, Construction, Operate, EoSL, ..)?

SMEs: Dynamics and content of the meetings we will have with that SMEs in order to detect their needs quickly

- 3. FORM OF CONTACT: surveys or meetings online? Individual or collective? Different SMEs together? Meetings of countries will not be together.

- 4. When meetings: Dynamics for dealing with and conducting effective meetings with SMEs (dynamic tools for proposing changes, what questions are essential, etc.)

POTENTIAL SPONSORS (material suppliers, other private companies, etc): Proposal of how to approach and what to offer in the meetings with the materials providers for funding.

- NUMBER & PROFILE: Has any partner already detected some material suppliers to contact? How many material suppliers and of which profile/sector do we have access to contact (T4.3)? National level – national pack?
- FORM OF CONTACT: How do we approach the meetings? Individual or collective? Protocol to approach?
- EXCHANGES PROPOSALS: What are they given in return? Strategies like publicity, demonstration of their products, involvement in training action to promote their products, etc.

Once all partners have agreed on the approach to be followed, these meetings with SMEs and sponsors will be held and the results will be processed in order to improve and modify, if necessary, the proposed plans. The conclusions and the final design of the Training Packs will be published on the BGC website, in the deliverable (D4.4) “BUS-GoCircular Training Packs report” (description and link to packs) and in the 8 “BUS-GoCircular fundamentals training packs”.

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Appendixes

Appendix 1: Training Plans TP1, TP2, TP3 and TP4

The Training Plans shown below are an example base from which to develop the final “BUS-GoCircular training packs” (The entire TP can also be fully developed, if time allows). These modules should be used as a basis for the development of the training pack, although you can be flexible in the combination of content, if appropriate. The contents or modules marked as Mandatory cannot be changed and must be developed in all packs.

	STARTING CIRCULARITY	TP1		21 hours		
Essential profiles	Contents	**Format for contents**	**Training methodology** *(from report)*	**Minium Time**	**Cost aprox.**	**Progress/ evaluation**
	COMMON MODULE					
	Module 1. INTRODUCTION TO CIRCULAR ECONOMY IN CONSTRUCTION			6:10 h	€	
Mandatory	**Key principles of circular economy**					
Mandatory	Prioritise regenerative and efficient use of resources	Interactive reading material + quiz	Microlearning courses			
Mandatory	Design for the future	Interactive reading material + quiz	Microlearning courses			
Mandatory	Assemble/construct for the future	Interactive reading material + quiz	Microlearning courses			
Mandatory	Rethink the business model	Interactive reading material + quiz	Microlearning courses			
Mandatory	Stretch the lifetime	Interactive reading material + quiz	Microlearning courses			
Mandatory	Use secondary resources	Interactive reading material + quiz	Microlearning courses			
Mandatory	Incorporate digital technology	Interactive reading material + quiz	Microlearning courses			
Mandatory	Collaborate to create joint value	Interactive reading material + quiz	Microlearning courses			
Mandatory	Strengthen and advance knowledge	Interactive reading material + quiz	Microlearning courses			
	Circularity definition and different vectors			10 min	€	
	Circularity definition. Materials, energy, waste and water	Videos /schemes	Information pills			
	PLAN					
	MATERIALS & WASTE			3:50 h	€€	
	Module 2. STRATEGIES OF CIRCULAR DESIGN IN MATERIALS			3:30 h	€€	
Mandatory	Main strategies related with materials in circular construction	Reading material	Information pills			
	1 Case study of "circular materials" (low impact, non-critical, local, non - toxic, bio-based, prefabricated-modular system)	Video	Information pills			
	1 Case study in reuse of materials in national level if possible: close loop, high quality reuse	Video	Information pills			
	1 Case study of renovation (showing savings versus NB)	Video	Information pills			
	2 Product demonstration	Visual presentation	Demonstration of circular products			
	Mantaince plan example	Reading material	Information pills			
	1 Visit with detective game to a different case study (from list)	Visit + quiz	Visit + "detective games"			
	Module 3. TOOLS TO SUPPORT CIRCULAR DESIGN IN MATERIALS			20 min	€	
Mandatory	How to read an EPDs	Video	Information pills			
Mandatory	2 Cases study: two EPD's to compare (one high impact like plastic element and other low impact)	Reading material	Information pills			
Mandatory	Material Circularity Indicator	Reading material	Information pills			
Mandatory	How to read material passports and its use	Example	Digital / self-led			
Mandatory	BIM modelling applications to building to aid circular applications	Video	Information pills			
	ENERGY			3:30 h	€€	
	Module 4. DESIGN TO REDUCE ENERGY DEMAND			3:00 h	€€	
	1 example with climate consultant analisys of 2 different climates and main strategies of psychometric chart	Video	Information pills			
	1 Visit with detective game to a case study with cool and hot bioclimatique strategies	Visit + quiz	Visit + "detective games"			
	Module 5. TOOLS TO SUPPORT ENERGY EFFICIENT DESIGN / DIGITIZATION			30 min	€	
	Software for energy simplify models (National energy certifications, CE3x, etc)	Video	Information pills			
	1 practice with Tools such as R10 from IVE for renovation, triplea-reno to get some initial advice	Exercise	Digital tool self-led			
	WATER			30 min	€	
	Module 6. DESIGN TO REDUCE WATER CONSUMPTION			10 min	€	
	1 Case study (national level) of Harvesting greywater and rainwater	Video	Information pills			
	1 Case study (national level) of purify water with Plant-based biofilters	Video	Information pills			
	1 Case study (national level) of draining pavements for public spaces or green roofs/facades	Video	Information pills			
	Module 7. TOOLS TO SUPPORT WATER EFFICIENT DESIGN / DIGITIZATION			20 min	€	
	1 practice with tool with tips for reducing water consumption (Drive 0)	Exercise	Digital tool self-led			
	PROCURE					
	MATERIALS & WASTE			5 h	€	
	Module 8. BANKS AND CERTIFICATION FOR MATERIALS			40 min		
Mandatory	Green building certification systems (LEED, BREAM, DGNB, VERDE, even Level(s)): materials credits/objectives focus	Video /simplify guide	Information pills			
	List of materials with Ecolabells	List /web	Digital / self-led			
Mandatory	How to read material passports	Reading material	Information pills			
Mandatory	How to use digital marketplaces to find or to sell (transformed) used materials	Reading material	Information pills			
Mandatory	Examples of marketplaces (existing online platforms or physical local stores) of reuse materials in national level	List /web	Digital / self-led			
	Module 18. BUSINESS MODELS			4:20 h		
	Strategies for providing building components as a service (e.g. installation company ensures good indoor climate and	Reading material	Information pills			
Real states and promoters	Leasing models and Rental models	Video /manual	Information pills			
Real states and promoters	Options for multi-use, sharing of spaces rather than ownership	Video	Information pills			
Real states and promoters	1 case study of co-housing or multi-use	Optional visit + quiz	Visit + "detective games"			
Mandatory	Buildings as a service not as a property	Video	Information pills			
	Strategies for promoting greater circularity in your company	Presentation + contest	Workshop contest			
Mandatory	Examples of European regulations requiring it (new circular economy legislation, embodied carbon for GP) and limit values	Reading material	Information pills			
	EoSL					
	MATERIALS & WASTE					
Waste Managers Material Producers	**Module 20.** USE SECONDARY RESOURCES			2 h		
	2 case study: recycled secondary materials/components from other industry (1) and from the same (1)	Video	Information pills			
	1 visit to plant of best practices in transforming recycling materials (recycling aggregates for concrete)	Visit	Visit case study			

	CONSTRUCTION WORKS IN CIRCULARITY	TP2		54:45 hours		
Essential profiles	Contents	**Format for contents**	**Training methodology** *(from report)*	**Minium Time**	**Cost aprox.**	**Progress/ evaluation**
	COMMON MODULE					
	Module 1. INTRODUCTION TO CIRCULAR ECONOMY IN CONSTRUCTION			6:10 h	€	
	Key principles of circular economy					
Mandatory	Prioritise regenerative and efficient use of resources	Interactive reading material + quiz	Microlearning courses			
Mandatory	Design for the future	Interactive reading material + quiz	Microlearning courses			
Mandatory	Assemble/construct for the future	Interactive reading material + quiz	Microlearning courses			
Mandatory	Rethink the business model	Interactive reading material + quiz	Microlearning courses			
Mandatory	Stretch the lifetime	Interactive reading material + quiz	Microlearning courses			
Mandatory	Use secondary resources	Interactive reading material + quiz	Microlearning courses			
Mandatory	Incorporate digital technology	Interactive reading material + quiz	Microlearning courses			
Mandatory	Collaborate to create joint value	Interactive reading material + quiz	Microlearning courses			
Mandatory	Strengthen and advance knowledge	Interactive reading material + quiz	Microlearning courses			
	Circularity definition and different vectors			10 min	€	
	Circularity definition. Materials, energy, waste and water	Videos /schemes	Information pills			
	CONSTRUCT					
	MATERIALS & WASTE		40:45 h	€€€		
Mandatory	Main strategies related with materials in circular construction	Video	Information pills			
	Module 2. BUILD TO CLOSE THE LOOP OF MATERIALS		13 h	€€€		
Mandatory	How to build in wood (different systems: CLT, laminated beams and colums, ballon frame)	Video	Information pills			
	National regulation requirements in wood structures (fire, acoustics, resistance, another limitation)	Reading material	Information pills			
	1 tutorial video in wood structure construction	Video	Information pills			
	1 workshop to choose: straw bricks, rammed earth, bio "concrete"(hemp), green roof or facade	Visual demonstration + exercise	Workshop practical			
	How to mix recycled aggregates in concrete	Video	Information pills			
	National/EU regulations of recycled concretes	Reading material	Information pills			
	How to build with biobased isolation	Video	Information pills			
	National regulation requirements with bio-based materials (fire, acoustics, resistance, exposition)	Reading material	Information pills			
	2 workshops to choose: recycled aggregates in concrete or mortar, recycled cotton isolation, wood fiber isolation, cellulose or wool sheep insuflation, cork exterior isolation, some of these isolation in ETICS systems	Visual demonstration + exercise	Workshop practical			
	4 video tutorial of the techniques no implemented in the workshop	Video	Information pills			
	Module 3. BUILD TO REDUCE IMPACT: LOCAL, LOW IMPACT, NON-TOXIC AND/OR NON-CRITICAL MATERIALS		9:30 h	€€		
Mandatory	How to build with low impact materials (besides of bio-based) in roofs	Video	Information pills			
	1 tutorial video in low impact roof	Video	Information pills			
	How to build with low impact materials (besides of bio-based) in coatings	Video	Information pills			
	1 workshop in low impact coatings (preference in pavement, carpets or panels, not paints or varnish)	Visual demonstration + exercise	Workshop practical			
Mandatory	Types of coating materials that can have emissions: paints, sealants, adhesives, floors, isolations, etc.	Video	Information pills			
	Coating materials with little to no volatile organic compound (VOC) emissions : low formaldehyde panels, COV's free	Reading material	Information pills			
	How to read a secutiry material sheet or another certificates (REACH, labels of these materials, etc)	Reading material	Information pills			
	2 product demonstration of low or zero COV emitting material: clay mortars, silicate or natural paints, lasurs or oils, etc	Visual presentation	Demonstration			
Mandatory	National/EU requirements or recomendation in interior material emission	Reading material	Information pills			
	1 workshop constest: how to replace at maximium plastic or concrete in a residential building and other materials proposals.	Presentation + contest	Workshop contest			
	Module 4. BUILD TO REDUCE WASTE IN SITE AND IN EOSL (PART1)		17:30 h	€€€		
Mandatory	Modular construction systems and their procedures for assembly (incl. prefabricated modules)	Video	Information pills			
	Removable joints in general (incl. those made from non-conventional materials, sealants that allow for disassembly,	Guide	Digital / self-led			
	Removable joints in wood	Guide	Digital / self-led			
	Removable joints in steel	Guide	Digital / self-led			
	1 workshops of removable joints (in wood, steel, prefabricated systems, etc.)	Visual demonstration + exercise	Workshop practical			
	How to build in pre-fabricated solutions in the market (national level) in facades: Wall sandwich panel with biobased isolation, full prefabricated wood wall, exterior facades of recycled content coatings, etc	Guide	Digital / self-led			
	1 product demonstration of modular construction system in facades	Visual presentation	Demonstration			
	How to build with pre-fabricated solutions in interior walls/pavements: dry systems, slot systems, etc.	Video	Information pills			
	1 workshops of interior elements: wooden/gypsum panels with wooden substructure, fermacell type slabs, wood/bamboo click flooring, hydraulic tiles on sand, etc.	Visual demonstration + exercise	Workshop practical			
	1 video tutorial of the techniques no implemented in the workshop	Video	Information pills			
	Disassemble one of the modular structures learned before	Video	Information pills			
	2 workshops in dismantling and reusing materials (close loop, high quality reuse): hydraulic tiles, structure element, interior panel, window or doors, etc.	Visual demonstration + exercise	Workshop practical			
	Module 5. BEST PRACTICES AT THE CONSTRUCTION SITE TO REDUCE WASTE AND PROMOTE RECYCLING		30 min	€		
Mandatory	Highlights of waste law actions and current waste management prices (national level): sorting, %, fees, nº waste	Reading material	Information pills			
	The importance of sorting waste streams correctly at the construction site, cleaning them for their subsequent	Video	Information pills			
	Difficult to separate or recycle solutions or materials	Video	Information pills			
	Optimization of materials in wet construction (pastes, binders) and reuse of leftovers at the construction site - examples	Video	Information pills			
	Avoid overlong on site storage of materials (protect them, well organised on site, special care with hazard waste or	Guide	Information pills			
	The importance of protecting and maintaining materials in place to extend service life (layers of differents	Reading material	Information pills			
	Module 6. DIGITIZATION		10 min	€		
	How to read plans and construction details in BIM	Video	Information pills			
	ENERGY					
	Module 7. INSTALL ENERGY EFFICIENCY MEASURES IN BUILDINGS: PASSIVE		5:15 h	€€		
	How to install a energy efficient window	Video	Information pills			
	How to build correctly a passive house (focusing in airtightness)	Video	Information pills			
	How to build ventilated controled roof	Video	Information pills			
	Ensure continuity of insulation in building envelope and pipes	Video	Information pills			
	How to build a trombe wall (MGRFI)	Video	Information pills			
	How to install a sollar collectors like atriums with solar protection (MGRFI)	Reading material	Information pills			
	Conduct draught-proofing in buildings	Video	Information pills			
	1 workshop of the before techniques	Visual demonstration + exercise	Workshop practical			
	1 demonstration of airtightness test	Demonstration	Demonstration			
	OPERATE					

	MATERIALS & WASTE					
	Options for energy and material savings during operation	Video	Information pills			
	Module 8. STRETCH THE LIFETIME		6:00 h	€€		
Mandatory	How to realise and implement mantaince plans: mantain and repair before changing (modularity to enable exchange of parts, accessible solutions to make them repairable, etc)	Guide	Digital / self-led			
	Maintenance plans according to material	Reading material	Information pills			
	Conduct regular checks for built structures	Guide	Digital / self-led			
	Common pathologies in exposed/non-exposed bio-based materials	Video	Information pills			
	Preservation and management with biological products on site	Video	Information pills			
	1 product demonstration	Visual presentation	Demonstration			
	Periodic treatment and maintenance of wood, straw and other bio-based materials used for the building.	Reading material	Information pills			
	1 workshop of treatment with biobased materials	Visual demonstration + exercise	Workshop practical			
	Importance of not exposing some biobased materials	Video	Information pills			
	Common pathologies in prefabricated elements (ventilated facades)	Video	Information pills			
	Maintanace of green roofs/facades	Video	Information pills			
	Module 9. RETHINK THE BUSINESS MODEL		2:20 h	€€		
Mandatory	Business models of maintenance and repair services (best practices)	Video	Information pills			
	Platform or list of SMEs that are innovative in upgrading services and maintanance	List /web	Digital / self-led			
	1 visit to one of the SMEs	Visit	Visit case study			
	Realise DIY techniques for repair and maintenance for enabling self-repair of users	Video	Information pills			
	1 case study	Video	Information pills			
	Definition of figures for the management of public buildings	Reading material	Information pills			
	Module 10. DIGITIZATION		15 min	€		
	BIM modelling for repair information	Video	Information pills			
	Maintanance sheets or materials passport	Example	Digital / self-led			

	CIRCULARITY IN INSTALLATIONS	TP3		24 hours (*41:30 h)		
Essential profiles	Contents	**Format for contents**	**Training methodology** *(from report)*	**Minium Time**	**Cost aprox.**	**Progress/ evaluation**
Mandatory	**COMMON MODULE**					
Mandatory	**Module 1.** INTRODUCTION TO CIRCULAR ECONOMY IN CONSTRUCTION			6:10 h	€	
Mandatory	**Key principles of circular economy**					
Mandatory	Prioritise regenerative and efficient use of resources	Interactive reading material + quiz	Microlearning courses			
Mandatory	Design for the future	Interactive reading material + quiz	Microlearning courses			
Mandatory	Assemble/construct for the future	Interactive reading material + quiz	Microlearning courses			
Mandatory	Rethink the business model	Interactive reading material + quiz	Microlearning courses			
Mandatory	Stretch the lifetime	Interactive reading material + quiz	Microlearning courses			
Mandatory	Use secondary resources	Interactive reading material + quiz	Microlearning courses			
Mandatory	Incorporate digital technology	Interactive reading material + quiz	Microlearning courses			
Mandatory	Collaborate to create joint value	Interactive reading material + quiz	Microlearning courses			
Mandatory	Strengthen and advance knowledge	Interactive reading material + quiz	Microlearning courses			
Mandatory	**Circularity definition and different vectors**			10 min	€	
Mandatory	Circularity definition. Materials, energy, waste and water	Videos /schemes	Information pills			
	CONSTRUCT					
	ENERGY					
	Module 2. INSTALL ENERGY EFFICIENCY MEASURES IN BUILDINGS: PASSIVE		15 min	€		
Mandatory	1 case study with Main passive design strategies for four season climates: crossed ventilation, solar protection, isolation, solar energy-inertia, solar captors to store passive energy, airtightness	Video /schemes	Information pills			*
	Conduct airtightness test	Video	Information pills			
	Module 3. INSTALL ENERGY EFFICIENCY MEASURES IN BUILDINGS: ACTIVE		2:15 h (*6:30h)	€€		
Mandatory	Apply smart solutions to installations and manage correctly (termostates, timetibles)	Video	Information pills			
	Systems and solutions that make intallations accesible to repair	Reading material/guides	Information pills			
	Sectorize installation to be adaptable to changes and reparations	Video/ Reading material	Information pills			
Mandatory	Energetic efficient systems that generates heat/cold (heat water pumps, underfloor heating, centralized systems versus individual, waste heat/district heating, etc.)	Video/ Reading material	Information pills			
	Efficient lighting systems	Video	Information pills			
Mandatory	Regulations related to energy limitations and with regards to energy source	Reading material	Information pills			*
	Install underfloor heating	Video / Guide	Information pills			
	Connection to district heating	Video / Scheme	Information pills			
	2 cases studies of underfloor heating + connection to district heating	Video	Information pills			
	Optional: 1 workshop of underfloor heating	Visual demonstration + exercise	Workshop practical			
	Install forced ventilation system in passive houses	Video	Information pills			
	Install roof fans and its benefit versus airconditioning (case study, interviews)	Video	Information pills			
	1 product demonstration of different forced ventilation systems and its installation	Visual presentation	Demonstration			
	How to install automatisation systems (domotics, sensors for energy management or CO2)	Video / Guide	Information pills			
	1 case study of sensors and domotic building (national level)	Video	Information pills			
	1 case study of sollar collectors installation like atriums with solar protection (MGRFI) with	Video	Information pills			
	Module 4. INSTALL RENEWABLE ENERGY SYSTEMS IN BUILDINGS		8:30 h	€€€		
Mandatory	Types of renewable energy (types, difference of autonoums/grid connection systems, types of batteries for storage energy)	Video	Information pills			
	Install solar panels	Video	Information pills			
	Install PV panels in roof	Video	Information pills			
	Install PV panels in facade	Video	Information pills			
	Install heat pumps (aerothermia) (and with solar panel connection)	Video	Information pills			
	Install biomass heaters /solutions	Video	Information pills			
	Install batteries for storage energy	Video	Information pills			
	Install another less common systems (geothermia, wind)	Video	Information pills			
	2 workshops to choose between the before techniques	Visual demonstration + exercise	Workshop practical			
	1 product demonstration of the techniques no implemented in the workshop	Visual presentation	Demonstration			
	Module 5. DIGITIZATION		45 min	€		
Mandatory	How to read intallations plans in BIM	Video	Information pills			
	1 video tutorial of PV calculation	Video	Information pills			
	Software for PV calculation	Exercise	Digital tool self-led			
Mandatory	Use of drones for site applications: drones and imaging technologies for collecting data in construction projects	Video	Information pills			
	WATER					
	Module 6. BUILD TO CLOSE THE LOOP OF WATER		3:00 h (*11:00h)	€€- €€€		
Mandatory	Water flows and reuse/save water systems	Video	Information pills			
	Install Dry toilets systems	Video	Information pills			
	How to design a greywater separation installation and it allowed/recommended applications	Reading material	Information pills			
	How to install a greywater treatment system in site	Video	Information pills			
	How to install a refilling of toilet cisterns (of greywater)	Video	Information pills			
	How to design a rainwater installation and it allowed/recommended applications	Reading material	Information pills			
	How to install a rainwater treatment system in site	Video	Information pills			
	Installation of irrigation system with rainwater harvesting	Video	Information pills			
	How to build a plant-based biofilters to purify water and retorn water to the environment	Video	Information pills			
	1 visit to a building that implements the three strategies of water shown (greywater and rainwater reuse and retorn to enviroment treatment)	Visit	Visit			
	Optional: 1 workshop in installation of greywater or rainwater treatment system or plant-based biofilters treatment, refilling of toilet system, dry toilet.	Visual demonstration + exercise	Workshop practical			
	1 product demonstration of the techniques no implemented in the workshop	Visual presentation	Demonstration			
Mandatory	Types of sustainable drainage systems (urbanisation) and draining pavements for public spaces	Video	Information pills			
	Installation of sustainable drainage systems (urbanisation) and draining pavements for public spaces	Video	Information pills			
	1 product demonstration of draining pavements for public spaces	Visual presentation	Demonstration			
	How to Build MGRFI for collecting water or self irrigation (also selection of native/adaptative plants)	Video / Reading material	Information pills			

	Optional: 1 workshop in installation a collecting water roof or facade	Visual demonstration + exercise	Workshop practical			
	Module 7. DIGITIZATION		10 min	€		
	How to read plans of water intallations in BIM	Video	Information pills			
	OPERATE					
	ENERGY					
Mandatory	Options for energy and material savings during operation	Video	Information pills			
	Module 8. STRETCH THE LIFETIME		2:15 h	€€		
	Active maintenance (includ. repair) of solar panels and connections (avoid overheating, dust reduces effectiveness,..)	Video	Information pills			
	Active maintenance (includ. repair) of PV panels and connections (avoid overheating, dust reduces	Video	Information pills			
	Active maintenance of heat pumps (aerothermia)	Video	Information pills			
	Active maintenance of boilders	Video	Information pills			
	Active maintenance of radiators or underfloor heating	Video	Information pills			
	Active maintenance of biomass heaters	Video	Information pills			
	Active maintenance of water systems	Video	Information pills			
	Discussion with an expert: Strech the lifetime of installations	Discussion	Face to face			
Mandatory	Maintenance plans according to installation	Reading material	Information pills			
Mandatory	Conduct regular checks for installations	Guide	Digital / self-led			
	Create guide for building users (example and exercise)	Exercise	Digital tool self-led			
	Module 9. RETHINK THE BUSINESS MODEL		25 min	€		
Mandatory	Business models of maintenance and repair services (best practices)	Video	Information pills			
Mandatory	Definition of figures for the management of public buildings	Reading material	Information pills			
	Platform or list of SMEs that are innovative in upgrading services and maintanance	List /web	Digital / self-led			
	1 case study of best practice	Video	Information pills			
	Module 10. DIGITIZATION		15 min	€		
	BIM modelling for repair information	Video	Information pills			
	Maintanance sheets or materials passport	Example	Information pills			

ADVANCING CIRCULARITY (in progress)		TP4		50 hours		
Contents	**ULO's**	**Format for contents**	**Training methodology** *(from report)*	**Minium Time**	**Cost aprox.**	**Progress/ evaluation**
COMMON MODULE						
PLAN						
MATERIALS & WASTE				8 h	€	
Minium 1 Visit with detective game to a different case study if you implemented more than 4 modules of materials)		Visit + quiz	Visit + "detective games"	2 h		
Module 2. DESIGN TO REDUCE MATERIALS DEMAND				15 min	€	
Structure and facades with lightweight materials: accurate structural design/ industrialised prefabricated products/ of wood		Content inside case studio				
Non essential layers for regulatory compliance		Content inside case studio				
Other optimization of quantities examples		Content inside case studio				
2 Cases study of lightweight industrialised prefabricated products or of wood facades, with minimal layers or no coatings		Videos + reading materials	Information pills			
Module 3. DESIGN TO CLOSE THE LOOP OF MATERIALS				1:30 h	€	
Types of renewable materials (bio-based) in construction		Video/ reading material	Information pills			
Advantages and barriers of biobased materials		Reading material	Information pills			
4 Cases study to chose from: wood structure, cork exterior isolation, straw bricks, rammed earth or bio "concrete"(hemp)		Videos	Information pills			
National regulation requirements with bio-based materials		Reading material /examples	Information pills			
Types of materials with recycled content		Video	Information pills			
2 Cases study : recycled aggregates in concrete, recycled cotton isolation, steel, aluminium windows, etc.		Videos	Information pills			
Barriers of recycled concretes and barriers in national/EU regulations		Article	Information pills			
1 Case of study in reuse of materials in national level if possible: close loop, high quality reuse		Video	Information pills			
Barriers of reuse materials (regulation, assays needed, existence of suppliers, insurances, money investment)		Reading material	Information pills			
Marketplaces (digital) of reuse materials in national level	48	List /webs	Digital / self-led			
1 Case of study in reuse of materials in national level if possible (more than gravel in foundations): open loop	20, 23	Video	Information pills			
Module 4. DESIGN TO REDUCE WASTE IN SITE AND IN EOSL (PART1)				2:15 h	€	
2 Cases of products demonstrations of modular and/or prefabricated (dry solutions)		Visual presentation	Demonstration of solutions			
Pre-fabricated solutions in the market (and sustainable insulation materials in prefabricated walls)	26	List /webs	Digital / self-led			
Minimaze raw materials and humid construction solutions in project	27	Video	Information pills			
An appropriate waste study and plan and construction limit values		Guide + example	Digital / self-led			
Modular construction solutions (prioritise standardised solutions and systems to increase possibilities of reuse)	28	Content inside case studio				
Types of detachable unions in prefabricated concrete, steel and wood structures, facade systems (to repair by parts or reuse)		Guide + example	Digital / self-led			
Design of disassemblability plan for the building (examples of clear demolition specifications)	78, 59	Example	Digital / self-led			
Difficult to separate or recycle solutions or materials	5	Video	Information pills			
Module 5. DESIGN TO REDUCE WASTE IN EOSL AND TO EXTEND THE SERVICE LIFE (PART2)				40 min	€	
Durability of materials vs. adaptability of continents (layers of differents durabilities)		Reading material	Information pills			
Strategies to make flexible and adapt to changing needs of occupants (e.g. partition walls and systems, modular structure dimensions, accesible instalattions, etc)	31	Level(s) guide	Digital / self-led			
Design with materials that enable multiple uses (roofs, facades - MGRFI): type and combination (no detailed)	5 appli	Reading material	Information pills			
Renovation vs. New building impact + Subsides or incentives EU or national.	45	Reading material	Information pills			
1 case study of renovation (showing savings versus NB)		Video	Information pills			
Importance of mantaince plans (modularity to enable exchange of parts, accessible solutions to make them repairable, etc)	30	Guide + example	Digital / self-led			
How to implement these strategies in your company		Presentation + contest	Workshop contest	*optional		
Module 6. DESIGN TO REDUCE IMPACT: LOCAL, LOW IMPACT, NON-TOXIC AND/OR NON-CRITICAL MATERIALS				1:20 h	€	
Types of low impact materials (besides of bio-based) in construction and advantages of each one	1, 2, 3, 4, 36	Video	Information pills			
Local materials suppliers (national level)		List /webs	Digital / self-led			
2 Cases study : at least one material not repeated in before modules and another biobased		Videos	Information pills			
National grants or subsidies-EU to promote their use		Reading material	Information pills			
Types of critical raw materials as defined by the EU to avoid	3	List EU	Information pills			
Materials that have little to no volatile organic compound (VOC) emissions	1	Video	Information pills			
Types of non-toxic construction materials (alternatives to anti-flame retardants used on wood, low formaldehyde panels, COV's free paints, etc)	4	Reading material	Information pills			
1 product demonstration of non-toxic material		Visual presentation	Demonstration			
Existing labels for materials (low-emitting materials, Ecolabelling)	38	Video	Information pills			
Module 7. TOOLS TO SUPPORT CIRCULAR DESIGN IN MATERIALS				1:30 h	€	
LCA /LCC assestment: methodology (embodied energy and carbon footprint)	25	Video	Information pills			
LCA /LCC assestment: environmental indicators	25	Video / readig	Information pills			
LCA software examples (OneClick, TCQ, free acces)	25	Video	Information pills			
2 Cases study: examples of LCA assestment (one new building, other renovation)		Videos	Information pills			
How to read an EPDs	36	Video	Information pills			
2 Cases study: two EPD's to compare (one high impact like plastic element and other low impact)	36	Videos	Information pills			
Material Circularity Indicator and limit values (not higher than X)	1	Reading material	Information pills			
Examples of European regulations requiring it (new circular economy legislation, embodied carbon for GP) and limit values	25	Reading material	Information pills			
Green building certification systems (LEED, BREAM, DGNB, VERDE, even Level(s)): materials credits/objectives focus		Video	Information pills			
Environmental costing models	53	Reading material	Information pills			
Module 8. DIGITIZATION				30 min	€	
Software that helps design modular (try an exercise with tool)	26	Exercise	Digital tool self-led			
BIM modelling applications to building to aid circular applications	57	Video	Information pills			
Material passports example and its use	47	Example	Digital / self-led			
3D printing materials		Video	Information pills			
ENERGY				6:45 h		
Module 9. DESIGN TO REDUCE ENERGY DEMAND				3:30 h	€€	
Different climates, its indicators (temperature, humity, solar radiation, cloudy days, etc) and how to read it (psychometric chart)	9	Video	Information pills			
Software to analysis and design with climate (one of: climate consultant, archiwizard, ecotect, ladybug in rhino,..)	9	Tutorial	Information pills			
1 example with climate consultant analisys of 2 different climates and main strategies of psychometric chart		Visual presentation	Information pills			
Introduction and History of Bioclimatique Buildings.		Reading material	Information pills			
Main passive design strategies for hot season: crossed ventilation, ventilation chimneys, solar protection, inertia	9	Reading material /schemes	Information pills			
1 case study with design strategies for hot climates or hot season (can be historical examples)		Video	Information pills			
Main passive design strategies for cold season: isolation, solar energy-inertia, solar captors to store passive energy, airtightness	9, 24	Reading material /schemes	Information pills			
1 case study with design strategies for cold climates or cold season (can be historical examples)		Video	Information pills			
Type of bio-based and low impact isolations (e.g. sheep's wool, cellulose, earthwool)	9	Reading material	Information pills			
1 product demonstration of isolation learned		Visual presentation	Demonstration			
1 demonstration of airtightness test		Demonstration	Demonstration			
Design MGRFI focusing in solar captors, trombe wall, PV facades/roofs, etc - case study		Video	Information pills			
1 Visit with detective game to one case study with all theses strategies		Visit + quiz	Visit + "detective games"			
Energy management for public buildings (programmes, profiles, savings)	54	Guide	Information pills			
Private management and the importance of the housing user handbook	54	Example	Information pills			
Module 10. DESIGN TO REDUCE ENERGY CONSUMPTION				1:30 h	€	
Types of systems that generates power (electric operations substitutes fossil fuel, lights and domestic appliances efficiency)	8, 10	Reading material	Information pills			
1 case study of efficient lights and movement sensors with save energy data		Video	Information pills			
Types of energetic efficient systems that generates heat/cold (heat water pumps, underfloor heating, centralized systems, waste heat/district heating, etc.)	8, 10	Videos	Information pills			
1 case study of waste heat/district heating		Video	Information pills			

Energy efficient stretagies with right management (set point temperature, individual controllers, timetable)		Video	Information pills			
1 case study of Energy efficient stretagies with automatisation (domotics, sensors for energy management)		Video	Information pills			
Regulations related to energy limitations and with regards to energy source	8	Reading material	Information pills			
Design sectorize and fleixble installation to be adaptable to changes and reparations		Video	Information pills			
How to reduce energy consumption in your company		Presentation + contest	Workshop contest	*optional		
Module 11. DESIGN TO NEUTRALISE THE ENERGY CONSUMED				1:00 h	€	
Types of renewable energy - e.g.solar/PV panels, solar thermal collectors, aerothermia, sustainable biomass, waste water heat recovery) - examples installed	10	Video	Information pills			
Systems autonoum or connected to grid	24	Reading material	Information pills			
1 product demonstration of renewable systems learned		Visual presentation	Demonstration			
Storage of excess power (types of batteries for storing renewable electricity produced)		Video	Information pills			
CO2 taxes and CO2 compensation programs		Reading material	Information pills			
Module 12. TOOLS TO SUPPORT ENERGY EFFICIENT DESIGN / DIGITIZATION				45 min	€	
Software for energy models (Design Builder, National energy certifications, etc)	26	Video	Information pills			
Tools such as R10 IVE for renovation or CE3x, triplea-reno	54	Exercise	Digital tool self-led			
Software for PV calculation		Exercise /Tutorial	Digital / self-led			
Software to design accurate lights		*Exercise /Tutorial*	*Digital / self-led*			
WATER						
Module 13. DESIGN TO REDUCE WATER DEMAND						
Existing energy-saving systems (in taps, toilets, etc.)	7					
Dry toilets system						
1 product demonstration of dry toilets systems if possible		Demonstration	Demonstration			
Water Efficient Use Guidelines for Users - example	54					
Choosing native and less consumptive plants (Guide or List)						
Module 14. DESIGN TO REDUCE WATER CONSUMPTION						
Systems of Harvesting greywater and it allowed/recommended applications						
1 case study (national level)						
Systems of Harvesting rainwater and it allowed/recommended applications						
1 case study (national level)						
Systems of purify water (Plant-based biofilters, etc)						
1 case study (national level)						
Appropriate and possible uses for phreatic water (local level)						
Maps of water wells and aquifer reserves (local level)						
Regulations related to water use and systems limitations						
Module 15. DESIGN TO CAPTURE WATER AND HUMIDITY						
Sustainable drainage systems (urbanisation) and draining pavements for public spaces						
1 case study (national level)						
Design MGRFI focusing in water captors and green roofs/facades						
1 case study (national level)						
Collect and reuse of water in humid interior areas (e.g. cellars, gims)						
Module 16. TOOLS TO SUPPORT ENERGY EFFICIENT DESIGN / DIGITIZATION				45 min		
1 tutorial of Software for water system calculations, plants irrigation		Tutorial	Digital / self-led			
BIM modelling applications to building to aid circular applications	57	Video	Information pills			
Another tool with tips for reducing water consumption (Drive 0)		Exercise	Digital tool self-led			
1 exercise of the tool		Exercise	Digital tool self-led			
PROCURE						
MATERIALS & WASTE						
Module 17. BANKS AND CERTIFICATION FOR MATERIALS						
Green building certification systems (LEED, BREAM, DGNB, VERDE, even Level(s)): materials credits/objectives focus						
Suppliers of sustainable materials (from different strategies). If this module is done alone, take all the product demonstrations from the other modules.	1, 2, 3, 4, 26,27,28, 36, etc					
List of good practice materials (national level)						
Resource hubs/ material banks	73					
List of materials with Ecolabells	38					
How to read an EPDs - example	36					
EPDs banks	36					
How to use digital marketplaces to find or to sell (transformed) used materials	79					
Examples of marketplaces (existing online platforms or physical local stores) of reuse materials in national level	48					
Tests that enable re-use/pre audition	82					
How to read material passports						
Insurance and guarantees needed for reused materials	82					
Module 18. BUSINESS MODELS						
Strategies for providing building components as a service (e.g. installation company ensures good indoor climate and remains owner of installations)	42					
Leasing models and Rental models	44					
Options for multi-use, sharing of spaces rather than ownership- 1 case study of co-housing or multi-use	44					
Buildings as a service not as a property						
Strategies for promoting greater circularity in your company	35					
Examples of European regulations requiring it (new circular economy legislation, embodied carbon for GP) and limit values	25					
EoSL						
MATERIALS & WASTE						
Module 19. ASSESSTMENT, LOGISTICS AND MARKET PLACE TO USE SECONDARY RESOURCES						
Adaptive reuse of existing buildings for a new purpose	66					
1 case study						
Assess the quality of materials to be reused (audit of waste)	78					
1 example						
Maximise lifetime of products after use	14, 16					
Disassemble modular structures	15, 65					
1 worskhop						
Organise logistics and storage of secondary materials	46, 48, 73					
Organise and provide guarantees for reused materials	47, 73, 82					
Trade secondary materials and products on digital marketplaces	16, 48, 79					
List of platform of digital marketplaces						
Module 20. USE SECONDARY RESOURCES						
Reuse, repurpose or recycle secondary materials/components/resources from the same industry	18, 20					
Reuse, repurpose or recycle secondary materials/components/resources from other industries	21, 23					
3 case study : reuse, repurpose or recycled from other industry (2) and from the same (1)						
Transform waste streams for reuse, repurpose, or recycle waste streams within the same industry (closed loop)	19					
Transform waste streams for reuse, repurpose, or recycle waste streams within other industries (open loop)	22					
1 visit to plant of best practices						
Collaborate with industry peers to create joint value and identify synergies (best practices)	34, 35					
Module 21. DIGITIZATION						
BIM modelling applications to building to aid circular applications	57					

Appendix 2: Training pack for your SME

This table will be further developed in “BUS-GoCircular training packs”[18] in Appendix 2.

TRAINING PLAN (TP)		TRAINING PACK (FTP)	SMEs
TP1	INITIAL CIRCULARITY	To define	All
TP2	CONSTRUCTION WORKS IN CIRCULARITY	To define	- Company specialised in specific material systems -installators - Masonry company - Carpenter (wood) company - Another specific professions (welder, plasterer, plumbers, etc) company - Maintenance company - Building company
TP3	CIRCULARITY IN INSTALLLATIONS	To define	- Electrical installation company - Water systems installation company - HVAC installation company - RE installations company
TP4	ADVANCE CIRCULARITY	To define	- Sustaintable consulting or engineering Architecture's office - Public management/ governance - Demolition company (or building companies) - Waste management company - Material producer - Waste treatment and recycling company

[18] Report in: https://busgocircular.eu/results/

Appendix 3 - Reference professions and trades

Table 5: Workfields, references professions and trades within the work fields with their corresponding reference codes

Work field	Reference professions and trades within the work field	Reference code
Ambition setting and governance	Policymaker / Policy advisor	**PA**
	Green Public Procurement (GPP) advisor	**GPPA**
Asset management	Asset manager; Real estate investor	**AM**
Urban planning	Urban planner	**UP**
Architecture	Architect; Interior architect; Architectural technician; Designer	**AR**
	Landscape architect; Green roof / green façade designer	**LA**
Civil engineering	Civil engineer; Construction engineer; Structural engineer	**CE**
	Façade design engineer	**FDE**
Electrical engineering	Electrical engineer; ICT engineer; Building automation engineer	**EL**
Mechanical engineering	Mechanical engineer; Energy engineer	**ME**
Environmental engineering	Environmental engineer	**EE**
Building management	Facility manager	**FaM**
	Building operator	**BO**
	Data analyst; BIM programmers, BIM designer; Software engineer; 3D image technician / engineer	**DA**
Construction management	Cost engineer; Project manager and coordinator; Quality control and assurance; Quantity surveyor	**C**
	Health and safety (H&S) advisor; H&S inspector; Site supervisor	**HS**
Surveying	Site surveyor; Land surveyor	**SS**
	Building surveyor	**BS**
Financing and procurement	Procurer / purchasing manager; Procurement officer	**PM**
	Project developer	**PD**
	Material scout	**MS**
Energy performance	Building energy consultant; Energy assessor	**BEC**
Sustainable building	Sustainability consultant; Sustainability assessor	**SC**
Conservation	Conservation officer; Conservation scientist	**CO**
Construction - building	Bricklayer Stone-layer, cutter and mason	**Br**
	Insulation installers	**II**
	Carpenter; Joiner	**FM**
	Façade worker; Plasterer	**FW**
	Roofers	**R**
	Gardener (roof and façade); Interior planter / landscaper; Arboriculturalist / Horticulturist	**Gd**
	Window installer / glazer	**WI**

	Wood manufacturer and finisher; Pre-fabricated building assembler; Truss assembler	**BA**
Construction - Technical installations	Plumber	**P**
	Electrical installer and technician	**EI**
	Renewable energy systems installer (electric)	**RESI**
	Renewable energy systems installer (thermal)	**RWT**
	Heat pump installer	**HPI**
	Ventilation installer; Air conditioning installer	**VI**
	Repair and maintenance operative; Maintenance planner; Safety maintenance operative	**RM**
Demolition and econstruction	Demolition / deconstruction labourer; supervisor	**DeL**
	Site analyst; Deconstruction auditor; Urban miner	**DeA**

Appendix 4: Online free access materials classification

The material shown in this section is the material found in T3.1, classified. Some of the new material found that is in the process of being classified is also added below. There is more available content found that will be updated during the development of task T4.4, while the final “BUS-GoCircular training packs” for SMEs at national and European level are being developed. All classified material will be definitively presented in D4.4. and completed, in order to be useful for SMEs (or other professionals) to create new packs not developed in this project.

Actual materials collected from D3.1 - **Free acces training materials related with subtasks and ULOs**

Language	Free acces materials TITLE	Subtask - Competences	ULO Nr.	Delivery location/type	Deliverable	Time	Level (I or II)	General/ so specific	NOTES
SP	**Rumbo 2030- Economia circular en el sector de la construccion**	General information, it deals with all stages with general but particular advice. It is not only introduction, there are also strategies and indoctrinators.		Online / self-led	long reading		I		
SP	**Informe_Cotec_Economia_Circular_2021_vfinal**	Report on the current state of the circular economy in spain and europe. Long. It talks about value chain and stuff. I don't know where to put it	NO	Online / self-led	report	10 min	I		
SP	**huella-hidrica**	Apply measures that replace freshwater with less impactful alternatives	6	Online / self-led	guide	20 pages	I	general	
		Enact water efficiency measures	7, 15	Online / self-led					
		Evaluate and assess the life cycle impacts of buildings, construction products and materials on the environment (emissions, soils, water, biodiversity, etc.)	25	Online / self-led					
SP	**huella-de-carbono**	Evaluate and assess the life cycle impacts of buildings, construction products and materials on the environment (emissions, soils, water, biodiversity, etc.)	25	Online / self-led			II		
		Source bio-based, reusable, non-toxic and non-critical materials	36						
SP	**Guía-sostenibilidad-en-la-construcción-IVE-Residuos**	Design to reduce waste during production and use	2, 26, 27, 28	Online / self-led			I		
		Reduce waste during production and construction	58	Online / self-led					
		Redefine building regulations to incentivise circular approaches in construction	80	Online / self-led					
SP	**Guía-sostenibilidad-en-la-construcción-IVE-Energía**	Replace energy sources with less impactful alternatives	8	Online / self-led			I		
		Apply suitable energy efficiency measures to the building design (taking into account building purpose and climate)	9	Online / self-led					
		Generate energy from renewable sources - e.g. solar, sustainable biomass	10	Online / self-led					
		Install renewable energy systems in buildings	63	Online / self-led					
SP	**Guía-sostenibilidad-en-la-construcción-IVE-Calidad-del-ambiente-interior**	Increase (access to) understanding of non-conventional construction materials	83	Online / self-led					
		Repair (active maintenance) existing structures and installations	15	Online / self-led					
SP	**Guía-sostenibilidad-en-la-construcción-IVE-Agua**	Apply measures that replace freshwater with less impactful alternatives	6	Online / self-led					
		Enact water efficiency measures	7, 15	Online / self-led					
SP	**GUIA-CERTIFICACIONES-SOSTENIBILIDAD**	Evaluate and assess the life cycle impacts of buildings, construction products and materials on the environment (emissions, soils, water, biodiversity, etc.)	25	Online / self-led					
		Source bio-based, reusable, non-toxic and non-critical materials	36	Online / self-led					
SP	**Etiquetado-ecologico**	Source bio-based, reusable, non-toxic and non-critical materials	36	Online / self-led	not interesting and incomplete				
SP	**E3CN_manual**	Replace energy sources with less impactful alternatives	8	Online / self-led	so complete for the ULO's detected				
		Apply suitable energy efficiency measures to the building design (taking into account building purpose and climate)	9	Online / self-led					
		Generate energy from renewable sources - e.g. solar, sustainable biomass	10	Online / self-led					
		Design to use and store energy more efficiently in buildings	24	Online / self-led					
		Install energy efficiency measures in buildings	56	Online / self-led					
		Install renewable energy systems in buildings	63	Online / self-led					
		Redefine building regulations to incentivise circular approaches in construction	80	Online / self-led					
		Apply measures that replace freshwater with less impactful alternatives	6	Online / self-led					
		Enact water efficiency measures	7, 15	Online / self-led					
		Design modular construction solutions	28	Online / self-led					
		Design buildings and installations that are made to last and to ensure longer use	31	Online / self-led					
		Educate construction clients on suitable construction and renovation options	53, 54	Online / self-led					
SP	**es_neeap_2017_es**	too general document and about various sectors	NO	-					
SP	**Programa formativo - aplicacion de la economia circular a la construccion**	Example of a circular framework approach, with definitions of modules and methodologies	NO	-					
CR	**GBPro**	No	NO	-					
CR	**Affirmation of green building**	Design with bio-based, non-toxic and/or non-critical materials	1, 2, 3, 4	Online / tutor-led					
		Source bio-based, reusable, non-toxic and non-critical materials	1, 2, 3, 4, 5, 36	Online / tutor-led					
		Increase (access to) understanding of non-conventional construction materials	83	Online / tutor-led					
		Evaluate and assess the life cycle impacts of buildings, construction products and materials on the environment (emissions, soils, water, biodiversity, etc.)	25	Online / tutor-led					
CR	**Manual for workers (theoretical and practical) - roofer**	Design roofs, façades, and interior elements with bio-based materials as an alternative for conventional construction materials		Online / self-led					
	(not so much this point)	Enact measures that reduce and optimise energy use through solutions on roofs and facades whilst taking into account building purpose and climate		Online / self-led					
		Provide repair services or maintenance services for multifunctional green roofs, façades, and interior elements		Online / self-led					
		Arrange a safe working environment and continuously consider health and safety requirements, especially for working on roofs and facades		Online / self-led					
CR	**Manual for workers - theoretical part (6-all)**	Reduce waste during production and construction	58	Online / self-led					
		Build modular structures	60	Online / self-led					
		Maximise lifetime of products in-use	11, 12, 13, 57	Online / self-led					
		Repair (active maintenance) existing structures and installations	15, 64	Online / self-led					
		Construct building components according to service business models	15, 60, 62	Online / self-led					
CR	**Manual for workers - practical (6-all)**	Reduce waste during production and construction	58	Online-workshop / tutor-led					
		Build modular structures	60	Online-workshop / tutor-led					
		Repair (active maintenance) existing structures and installations	15, 64	Online-workshop / tutor-led					

		Construct building components according to service business models	15, 60, 62	Online-workshop / tutor-led					
CR	**Manuals for trainers (6-all)**	Reduce waste during production and construction	58	Online / self-led					
		Build modular structures	60	Online / self-led					
		Maximise lifetime of products in-use	11, 12, 13, 57	Online / self-led					
		Repair (active maintenance) existing structures and installations	15, 64	Online / self-led					
		Construct building components according to service business models	15, 60, 62	Online / self-led					
	Zero Energy Design (MOOC)								
EN	**List of relevant materials incl. Links- video 1**	Apply suitable energy efficiency measures to the building design (taking into account building purpose and climate)	9	Online / self-led					
EN	**List of relevant materials incl. Links- video 2**	Apply suitable energy efficiency measures to the building design (taking into account building purpose and climate)	9	Online / self-led					
EN	**List of relevant materials incl. Links- video 3**	Apply suitable energy efficiency measures to the building design (taking into account building purpose and climate)	9	Online / self-led					
		Install energy efficiency measures in buildings	56	Online / self-led					
EN	**List of relevant materials incl. Links- video 4**	Apply suitable energy efficiency measures to the building design (taking into account building purpose and climate)	9	Online / self-led					
EN	**List of relevant materials incl. Links- video 5**	Apply suitable energy efficiency measures to the building design (taking into account building purpose and climate)	9	Online / self-led					
EN	**List of relevant materials incl. Links- video 6**	Generate energy from renewable sources - e.g. solar, sustainable biomass	10	Online / self-led					
		Install renewable energy systems in buildings	63	Online / self-led					
EN	**List of relevant materials incl. Links- video 7**	Generate energy from renewable sources - e.g. solar, sustainable biomass	10	Online / self-led					
EN	**List of relevant materials incl. Links- video 8**	Design to use and store energy more efficiently in buildings	24	Online / self-led					
EN	**List of relevant materials incl. Links- video 9**	Design multifunctional green roofs, façades, or interior elements that are made to last and to ensure longer use (to contribute to multiple uses and lifecycles of a building)	31	Online / self-led					
EN	**List of relevant materials incl. Links- video 10**	Apply suitable energy efficiency measures to the building design (taking into account building purpose and climate)	9	Online / self-led					
		Generate energy from renewable sources - e.g. solar, sustainable biomass	10	Online / self-led					
		Design to use and store energy more efficiently in buildings	24	Online / self-led					
EN	**List of relevant materials incl. Links- video 11**	Generate energy from renewable sources - e.g. solar, sustainable biomass	10	Online / self-led					
EN	**List of relevant materials incl. Links- video 12**	Generate energy from renewable sources - e.g. solar, sustainable biomass	10	Online / self-led					
EN	**List of relevant materials incl. Links- video 13**	Design multifunctional green roofs, façades, or interior elements that are made to last and to ensure longer use (to contribute to multiple uses and lifecycles of a building)	31	Online / self-led					
		Construct multifunctional green roofs, façades, or interior elements	69	Online / self-led					
	Decarbonize Design								
EN	**Decarbonize Design - A field guide for designers and builders -**	Replace energy sources with less impactful alternatives	8	Online / self-led					
	(general)	Apply suitable energy efficiency measures to the building design (taking into account building purpose and climate)	9	Online / self-led					
		Generate energy from renewable sources - e.g. solar, sustainable biomass	10	Online / self-led					
		Design to use and store energy more efficiently in buildings	24	Online / self-led					
		Evaluate and assess the life cycle impacts of buildings, construction products and materials on the environment (emissions, soils, water, biodiversity, etc.)	25	Online / self-led					
		Develop and conduct research about applied circular construction strategies	52, 82	Online / self-led					
		Employ material passports throughout each phase of the building/project	47	Online / self-led					
		Employ technologies to gather and analyse data to provide and gain insights on resource use (procure, operate, end of service life)	46, 47	Online / self-led					
		Design products and building structures to enable reuse and recycling	29	Online / self-led					
		Design products and building structures that make repair accessible	30	Online / self-led					
	Sustainable Materials Management (MOOC)			Online / self-led					
EN	**Value & governance**	Redefine building regulations to incentivise circular approaches in construction	80	Online / self-led	video	4 min		general	
EN	**The importance of networks for sharing information**	Collaborate with industry peers to create joint value and identify synergies	34, 35	Online / self-led	video	7 min		general	
EN	**Policies for circular economy**	Redefine building regulations to incentivise circular approaches in construction	80	Online / self-led	video	3 min		general	
EN	**'Right to repair'**	Offer construction maintenance and repair services	43, 64	Online / self-led	article				
		Repair (active maintenance) existing structures and installations	15, 64	Online / self-led					
EN	**List of relevant materials - Criticality of materials**	Source bio-based, reusable, non-toxic and non-critical materials	3		graphic	5 min		specific	
	Circular Economy for a Sustainable Built Environment (MOOC)								
EN	**the-circularity-gap-report-2018**							general	
EN	**Overview on bio-based building material made with plant aggregate**	Design with bio-based, non-toxic and/or non-critical materials	1, 2, 3, 4	Online / self-led	scientific article	10 min	II	specific	
		Source bio-based, reusable, non-toxic and non-critical materials	1, 2, 3, 4, 5, 36						
		Reuse, repurpose or recycle secondary materials/components/resources from other industries	21, 23						
EN	**Materials life cycle assessment of a living building**	Evaluate and assess the life cycle impacts of buildings, construction products and materials on the environment (emissions, soils, water, biodiversity, etc.)	25	Online / self-led	scientific article	15 min	II	specific	
EN	**Material Flow Analysis_Introduction_to_methodology**	Evaluate and assess the life cycle impacts of buildings, construction products and materials on the environment (emissions, soils, water, biodiversity, etc.)	25	Online / self-led	pdf	23 pages related with CE		specific	
		Design to reduce waste during production and use	2, 26, 27, 28						
EN	**Life Cycle Assessment of Building Materials for a Single-family House in Sweden**	Evaluate and assess the life cycle impacts of buildings, construction products and materials on the environment (emissions, soils, water, biodiversity, etc.)	25	Online / self-led	scientific article	3 min	II	specific	
EN	**Introduction to LCA of Buildings**	Evaluate and assess the life cycle impacts of buildings, construction products and materials on the environment (emissions, soils, water, biodiversity, etc.)	25	Online / self-led	pdf	14 easy pages	I	specific	
		Design with bio-based, non-toxic and/or non-critical materials	1, 2, 3, 4						
		Source local and lightweight materials	74						

		Reuse, repurpose or recycle secondary materials/components/resources from the same industry	18, 20						
		Engage and guide customers and users to ensure circular use of buildings and products	37, 38, 75						
NE	**Example of a Local waste cooperation**	Reuse, repurpose or recycle secondary materials/components/resources from other industries	21, 23	Online / self-led	example of a company	1 min	I	specific	not so interesting content to teach
EN	**Design for Disassembly in the Built Environment**	Design products and building structures to enable reuse and recycling	29	Online / self-led	guide	69 pages	I	general	interesting because arrive to details and examples
		Design products and building structures that make repair accessible	30						
		Design with use of pre-fabricated solutions	26						
		Design modular construction solutions	28						
		Compile and provide deconstruction / demolition specifications at the commissioning stage	59						
		Build modular structures	60						
EN	**Design for Disassembly and Deconstruction - Challenges and Opportunities**	Design with use of pre-fabricated solutions	26	Online / self-led	scientific article	4 min	I	general	not so deep
EN	**A Holistic Sustainability Framework for Waste Maagement in European Cities - Concept Development**	Design to reduce waste during production and use	2, 26, 27, 28	Online / self-led	scientific article	33 pages	I	general	
		Reduce waste during production and construction	58						
		Transform waste streams for reuse, repurpose, or recycle waste streams within the same industry (closed loop)	19						
		Transform waste streams for reuse, repurpose, or recycle waste streams within other industries (open loop)	22						
EN	**Reference teaching material for adapting the course module to suit the needs of target audience**	Some methodologies appreaciations	NO						
HU	**NEWCOM_Building inspector**	Apply suitable energy efficiency measures to the building design (taking into account building purpose and climate)	9	Online / tutor-led					
		Generate energy from renewable sources - e.g. solar, sustainable biomass	10	Online / tutor-led					
		Design to use and store energy more efficiently in buildings	24	Online / tutor-led					
		Install renewable energy systems in buildings	63	Online / tutor-led					
		Construct building components according to service business models	15, 60, 62	Online / tutor-led					
		Install energy efficiency measures in buildings	56						
		Conduct workplace trainings on circular construction	49, 50	Online / tutor-led					
HU/EN	**NEWCOM_flat roofer**	Build modular structures	60	Online / tutor-led					
		Maximise lifetime of products in-use	11, 12, 13, 57	Online / tutor-led					
		Repair (active maintenance) existing structures and installations	15, 64	Online / tutor-led					
		Construct building components according to service business models	15, 60, 62	Online / tutor-led					
EN	**Fit-to-nZeb. Building Knowledge Hubs**	a guide by daniela has examples of train the trainers. It has several training frameworks developed. See page 15 for SMES packs		Online / self-led					
EN	**Fit-to-nZeb**			Online / self-led					
	http://www.powerhouseeurope.eu/cases_resources/resources/	This site has a lot of open source material and can be used for the packs.							
CZ	**Metodika veřejného i soukromého cirkulárního nakupování (Methodology for public and private sector circular procurement)**	Fit		Online / self-led					
CZ	**Cirkulární Česko - Cirkulární veřejné zakázky a soukromé nákupy (Circular Czechia - Circular public procurement and private sector purchasing handbook)**	Shorter graphical version of above (40 pages).		Online / self-led					
CZ	**Metodika pro školitele a lektory (Methodology for trainers and lecturers in circular procurement)**	Methodology for trainers and lecturers (train the trainer manual) for the above circular procurement courses		Online / self-led					
	IRELAND TRAINING MATERIALS	MISSING ALL THIS FOLDER							
EN	**WP3-O3.3-Training-and-assesment-methodology_FINAL**	Info can be found on the BIMzEED website	2,9, 10, 27, 34, 57						
EN	**Introduction to Low Energy Building Construction**		8, 9, 10, 24, 63, 67, 81						
EN	**nZEB Retrofit**		8, 9, 10, 24, 63, 67						
	Other materials / inspiration	MISSING ALL THIS FOLDER							
EN	**TUS_Circular Economy Webinar V3**		5, 11, 12, 14, 20, 22, 23, 25, 27, 29, 30, 53, 55, 58, 61, 81						

Level I: not necessarilly initial knowings about circularity
Level II: some knowing needed, like reading specific indicators and graphics

Specific: addresses a specific topic under the concept or competencies it relates to
General: addresses to the concept and give some advice, definitions, various topics

NEW training materials found - Free acces training materials related with subtasks and ULOs

Language	Free acces materials TITLE	Subtask - Competences	ULO Nr.	Delivery location/type	Deliverable	Time	Level (I or II)	General/ so specific	NOTES
EN	TUS_Circular Economy Webinar V3.pdf	Gain an understanding of what the Circular economy is and what is included within it. What is Circular Economy? From Linear to Circular Overview of the importance of Circular Economy and what is it? Reference existing circular guides such as the SDG's	15						
EN	5.2 17.pdf	Recognise and understand the the benefits of Circular Economy to the construction industry Circular Economy and the Construction industry Three key principles (or similar) Key Elements	58						
EN	https://ellenmacarthurfoundation.org/topics/circular-economy-introduction/overview A Holistic Sustainability Framework for Waste Management in European Cities - Concept Development.pdf	Circular Economy Situations relating to construction EU Level National Situations (by trainers)	61						
EN	4_SWR_Clients_Factsheet2021.pdf	MGRFIE Definitions (note what safety guidelines must be met) What is it and why have we selected it? what are the overlaps with Circular Economy							
EN	2_roadmap_circular_land_tendering.pdf								
EN	Circular Economy for the built environment a summary.pdf								
EN	https://www.czgbc.org/files/2021/01/91b65a0bf6725d54354f59daa9f46f0b.pdf Case study 2.2 Construction and Demolition Waste and Materials (Level's)								
EN	https://environment.ec.europa.eu/strategy/circular-economy-action-plan_en								
EN	WP3-O3.3-Training-and-assessment-methodology_FINAL.pdf	Understanding the opportunities of implementing Circularity into the construction sector Introduction to circular practices In design phase Introduction to circular practices In build phase Introduction to circular practices In deconstruction phase	27						
EN	TUS_Circular Economy Webinar V3.pdf	Modular and adaptable What is modularity What is adaptability	28						
EN	Zero Energy Design (MOOC).docx	Modular design What is modular design Assembly and disassembly in Design Phase What is functional adaptation in design - Add value to the building as it is being upgraded Case Study (Or studies)	29						
EN	Material Flow Analysis_Introduction_to_methodology.pdf	Modular (assembly and disassembly) Construction Phase Modular Construction What is modular Building Assembly and disassembly in Build Phase What is functional adaptation in build - Add value to the building as it is being upgraded Case Study (Or studies)	54						
EN	A Holistic Sustainability Framework for Waste Management in European Cities - Concept Development.pdf	Reuse as a service (Design and building life) What is meant by reuse as a service Reuse in each phase of construction Opportunities	60						
EN	Design for Disassembly and Deconstruction - Challenges and Opportunities.pdf	Reference any other design, build or deconstruction opportunities for more circular buildings of interest to trainees NZEB (Example)	65						
EN	Design for Disassembly in the Built Environment (1).pdf	Design and build MGRFIE Longevity and adaptability of buildings Implementation in every phase of the building (benefits)	76						
EN	Decarbonize Design.docx								
EN	https://www.koma-modular.cz/en/references/list-of-references								
EN	https://kingcounty.gov/~/media/depts/dnrp/solid-waste/green-building/documents/KC_Green_Roof_case-study.ashx?la=en								
EN	Overview on bio-based building material made with plant aggregate.pdf	Bio based materials Increasing access and knowledge What are they and what do they include? What are the barriers to using Bio Based materials (National level) What are some of the fears and hesitations of the trainees (Suggested Question and workshop)	1						
EN	https://www.metabolic.nl/publications/biobased-renovation/	Existing biomaterials What materials are currently being used Example - Timber (This must be selected based on trainee profiles) Case study	17						
EN	https://www.google.com/url?q=https://drive.google.com/drive/u/0/folders/1HPlLuuPUdyFVMibd8DnbA_KV9KyYnGXy&sa=D&source=docs&ust=1669244377593189&usg=AOvVaw2Z94IUL5yAqYlC6NvjuG1r	New biomaterials What new materials are now being used in the construction sector Example - Bio concrete (This must be selected based on trainee profiles) Case study	68						

EN	https://www.thinkwood.com/mass-timber	Caring for biomaterials Based on the examples above or other relevant examples how can this material be protected Example - Cob often has large overhangs to protect a cob building from rain water damage (This must be selected based on trainee profiles)	83						
EN	https://issuu.com/nikosdragom/docs/building_with_earth_design_and_tech	Bio Based material opportunities for MGRFIE How can materials be applied to MGRFIE What are the limitations and opportunities Case study if possible							
EN	https://www.youtube.com/watch?v=ieBVNgMkcpw								
EN	https://www.youtube.com/watch?v=2gWxRVqNI3M								
EN	https://www.google.com/url?q=https://www.youtube.com/watch?v%3D3fP0LZMEV5w&sa=D&source=docs&ust=1669244377603767&usg=AOvVaw04f0oZ2KJzeyUFKqR_Ey6k								
EN	https://www.metabolic.nl/publications/using-timber-in-construction/								
EN	https://www.google.com/url?q=https://www.youtube.com/watch?v%3Dv3JqSsc8ZKk&sa=D&source=docs&ust=1669244377599866&usg=AOvVaw13T-pqBsFohcc1TO0toDXB								
EN	https://www.google.com/url?q=https://tectonica.archi/projects/85-viviendas-sociales-en-cornella-de-peris-toral-arquitectes/&sa=D&source=docs&ust=1669244377600060&usg=AOvVaw3UnbP4RrHRA9zKbYmbzQLp								
EN	https://www.google.com/url?q=https://www.bfa.cat/page-3/page-33/&sa=D&source=docs&ust=1669244377600183&usg=AOvVaw0RlqaTh0tzjD_Gr1PfPPdY								
EN	https://www.google.com/url?q=https://www.youtube.com/watch?v%3DdyeI2_bo4Ws%26t%3D108s&sa=D&source=docs&ust=1669244377600318&usg=AOvVaw0_MpLFBgCw9GkLUQujT75D								
EN	https://www.google.com/url?q=https://www.youtube.com/watch?v%3DvZLUoDX3k08%26t%3D56s&sa=D&source=docs&ust=1669244377600421&usg=AOvVaw2etwgSq0xD_iq4ihr5nph9								
EN	TUS_Circular Economy Webinar V3.pdf	Overview of what is meant by Retrofits, Upgrads, Repairs and Maintenance When to implement each of these in the construction process What is the impact of these topics	11						
EN	Right to repair'.pdf	repairs and maintenance as a service What is meant by repairs and maintenance as a service Repair and maintenance guidance opportunities (Toolkit-Examples)	12						
EN	5.2 12.pdf	Upgrades as a service What is meant by upgrades as a service What are the opportunities associated with upgrade in construction	13						
EN	5.2 13.pdf	Retrofits as a service (case study) What is meant by Retrofits as a service What are the opportunities Retrofits with upgrade in construction What are some examples of retrofitting opportunities Toolkit- Examples (Relate to trainee present)	30						
EN	https://www.metabolic.nl/publications/biobased-renovation/	Rental models What is a rental model and what can be included in this? Leasing models - The Netherlands as an example (Elevators by Mitsubishi)	31						
EN	https://methodstatementhq.com/building-operation-maintenance-manual-template-in-word-format.html	Retrofits, Upgrads, Repairs and Maintenance for MGRFIE How is this applicable to MGRFIE What already exist here (National Example) How is this incentivised? Case study	42						
EN	https://www.drive0.eu/estonia-pilot-inaugurated/		43						
EN	758 NZEB Retrofit_Version 1.3-compressed.pdf		44						
EN	https://www.koma-rent.cz/		45						
EN	https://www.czgbc.org/files/2019/10/d8145933f5d999aa8cd7397dc21d1fb1.pdf Decarbonize Design.docx	Water in construction What is the importance considering water in circular economy	6						
EN	5.2 8.pdf	Water Reuse Greywater collection, purification and reuse Rainwater collection and use SuDS	7						
EN	WP3-O3.3-Training-and-assessment-methodology_FINAL.pdf	Design Phase Optimisation of water in the design phase Case Study							
EN	758 NZEB Retrofit_Version 1.3-compressed.pdf https://www.czgbc.org/files/2022/01/5a6939b042bdaafae6134cd9a117bd2b.pdf	Construction phase Optimisation of water in the construction phase Case Study							
EN	758 NZEB Retrofit_Version 1.3-compressed.pdf	Energy in construction What is the importance considering energy in circular economy measures to reduce energy loss on site Energy storage throughout the building life	8						
EN	D2.3-QualiBuild-FES-Learners-Handbook-Final_PU.pdf	Design Phase Optimisation of energy in the design phase Selecting materials with a lower energy impact (Embodied Energy) Case Study	9						
EN	5.2 2.pdf	Construction phase Optimisation of energy in the construction phase Selecting materials with a lower energy impact (Embodied Energy) Case Study	10						

EN	5.2 8.pdf	Renewable energy sources Examples based on trainee present (Heat Pumps, Solar, Biomass)	24						
EN	5.2 13.pdf	Application for MGRFIE Energy on MGRFIE Benefits and Barriers Cooling Function Case Study/Examples	56						
EN	5.2 14.pdf		63						
EN	5.2 16.pdf		67						
EN	Zero Energy Design (MOOC).docx								
EN	https://madaster.com/platform/	The trainer will deliver the following key points for this module Digitalization in design and construction What does this entail Definitions and examples What is the relevance to the Circular Economy	46						
EN	5_Orms-Materials-Passports_flipbook-correct-QR.pdf	BIM What is BIM and what are its applications BIM live runthrough if necessary Reduce material waste, building upkeep, repairs and building upgrades As applied to Circular Economy	47						
EN	Decarbonize Design.docx	Drones What is the relevance of drones and what are there applications Building scanning and analysis for upkeep and repair Drones, live runthrough if necessary What safety measures are necessary (Licence) As applied to Circular Economy	57						
EN	Introduction to LCA of Buildings.pdf	VR (Headsets and exoskeleton suits) What is the relevance of VR and what are there applications Training and material reduction VR, live runthrough if necessary As applied to Circular Economy	84						
EN	WP3-O3.3-Training-and-assessment-methodology_FINAL.pdf	3D modelling and prefabrication What is the relevance of 3D modelling and prefabrication and what are there applications Material reduction and onsite application 3D modelling and prefabrication, live runthrough if necessary As applied to Circular Economy	75						
EN	https://www.metabolic.nl/publications/materials-passports/	Material passports What is the relevance of Material passports and what are there applications Barriers and benefits of material passports Case study or examples (Orms) As applied to Circular Economy	26						
EN	https://www.bamb2020.eu/topics/materials-passports/		70						
EN	https://www.igbc.ie/wp-content/uploads/2021/12/CMEx-One-page-Flyer.pdf								
EN	https://www.dgbc.nl/life-levels-172	Material Impact Reduction Definition and overview of material impact reduction What are some tools that can be used used in order to reduce material impact Barriers and opportunities	2						
EN	TUS_Circular Economy Webinar V3.pdf	Green Public Procurement What is GPP How can this be implemented National situation	3						
EN	https://ec.europa.eu/environment/eussd/pdf/Level_publication_EN.pdf Sustainable Materials Management (MOOC).docx	Life Cycle Analysis What is LCA How can this be implemented National situation An example of this in practice where applicable	4						
EN	Case study 6.1 Life cycle costs (Level's) Material Flow Analysis_Introduction_to_methodology.pdf	Life Cycle Costing What is LCC How can this be implemented National situation An example of this in practice where applicable	25						
EN	Materials life cycle assessment of a living building.pdf	Level(s) What are the EU Level(s) and why are they relevant	36						
EN	https://www.oireachtas.ie/en/bills/bill/2022/35/ Overview on bio-based building material made with plant aggregate.pdf	MGRFIE Applying what has been covered here to MGRFIE	74						
EN	Case study 6.2 Life cycle costs (Level's) A Holistic Sustainability Framework for Waste Management in European Cities - Concept Development.pdf								
EN	Introduction to LCA of Buildings.pdf								
EN	Life Cycle Assessment of Building Materials for a Single-family House in Sweden.pdf								
EN	Decarbonize Design.docx								
EN	10a. Life Cycle Costing_FINAL Review.pptx								
EN	2_roadmap_circular_land_tendering.pdf								
EN	04. Circular Economy and GPP_FINAL Review.pptx								
EN	5.2 9.pdf								
EN	https://docs.google.com/presentation/d/1ZG1c47YjourLYdGKNjnwhwAk3D6i9ZmS/edit?usp=share_link&ouid=112148808974461842163&rtpof=true&sd=true								
EN	https://docs.google.com/presentation/d/1kHg-VbnDV2XJZrnhixEd8hlNm2X1lf6T/edit?usp=share_link&ouid=112148808974461842163&rtpof=true&sd=true								

EN	https://docs.google.com/presentation/d/1C26gUDSCz7HLPuuP4QgebsI9t_kuqET2/edit?usp=share_link&ouid=112148808974461842163&rtpof=true&sd=true								
EN	https://docs.google.com/presentation/d/1AOCA3PC73i0HUjcSEbn5YBmJ2uOKz1kQ/edit?usp=share_link&ouid=112148808974461842163&rtpof=true&sd=true								
EN	https://vlegalwaymayo.atu.ie/pluginfile.php/834642/mod_resource/content/14/Irish-GPP-Criteria-Office-Buildings.pdf								
EN	https://www.gov.ie/en/publication/b542d-whole-of-government-circular-economy-strategy-2022-2023-living-more-using-less/								
EN	Introduction to LCA of Buildings.pdf	Material Reuse What does it mean to reuse waste in construction Change of language and possibly classification of materials What are the opportunities (Links to GPP and Biomaterials) What are the barriers (Some national level barriers)	5						
EN	Example of a Local waste cooperation.pdf	Implementing material reuse How to implement this in practice Opportunities associated when paired with material passports Transforming materials for further use (Lower value materials if necessary) Examples (aggregates)	16						
EN	A Holistic Sustainability Framework for Waste Management in European Cities - Concept Development.pdf	Real life examples Based on trainees case studies should be provided here	19						
EN	Overview on bio-based building material made with plant aggregate.pdf	Digital marketspace What is a digital market space Examples (national examples needed)	20						
EN	TUS_Circular Economy Webinar V3.pdf	Material Banks What is a digital material bank Case study	21						
EN	https://www.igbc.ie/wp-content/uploads/2021/12/CMEx-One-page-Flyer.pdf	MGRFIE How does material reuse for the circular economy relate to MGRFIE	22						
EN	http://www.recyklujmestavby.cz/		23						
EN	Design for Deconstruction case study from Level(s) learning journey	Deconstruction What is Deconstruction What are the barriers and opportunities Embodied Carbon	14						
EN	TUS_Circular Economy Webinar V3.pdf	Pre-demolition survey What does this entail and what value can it bring Case Study	18						
EN	Design for Disassembly in the Built Environment (1).pdf	Urban mining What does this entail and what value can it bring Case Study	59						
EN	Introduction to LCA of Buildings.pdf	Planning for Deconstruction Designing for deconstruction Case Study	77						
EN	https://www.metabolic.nl/publications/circular-demolition/	Material Passports and Deconstruction What are the benefits of using both Material Passports and Deconstruction alongside one another Implementation							
EN	https://www.nweurope.eu/projects/project-search/fcrbe-facilitating-the-circulation-of-reclaimed-building-elements-in-northwestern-europe/#tab-1	Example Case Study of a full deconstruction project							
EN	Decarbonize Design.docx	Collaboration and Knowledge sharing Expanding knowledge through further education and upskilling (Further materials etc) Sharing knowledge within your community and workplace Collaboration with other members of the value chain (Government, Public, Design, Build etc)	32						
EN	Introduction to LCA of Buildings.pdf	Integration and implementation of Circular Economy in the workplace Ensuring your team has a variety of experts in all elements relating to Circular Economy Enacting and supporting implementation through Communication, Knowledge sharing and facilitation	33						
EN	Value & governance.mp4	Regulation and definition European regulations, legislation and Definitials National regulations, legislation and Definitials	34						
EN	Policies for circular economy.mp4	Barriers What is missing and what is there to support implementation (European) What is missing and what is there to support implementation (National)	35						
EN	The importance of networks for sharing information.mp4	MGRFIE How does this relate to MGRFIE What are the barriers and opportunities	37						
EN	TUS_Circular Economy Webinar V3.pdf		38						
EN	WP3-O3.3-Training-and-assessment-methodology_FINAL.pdf		39						
EN	D2.3-QualiBuild-FES-Learners-Handbook-Final_PU.pdf		40						
EN	5.2 15.pdf		41						
EN	https://incien.org/wp-content/uploads/2022/04/Metodika_Cirkularni-zadavani-a-nakupy_WEB.pdf		49						
EN	https://klima.praha.eu/DATA/Dokumenty/Cirkularni-Praha-2030-Strategie-CE.pdf		50						
EN	https://www.mzp.cz/cz/cirkularni_cesko		51						

Appendix 5: Iconography

G1 Indicator that it is a essential module for a certain profile

€ Range of expected module cost, with range from €, very low to €€€, higher cost

 Individual insignia / rewards when the module is finished

 Conducted visit to a case study (groupal)

 Visit a case study with "detective game"(groupal)

 Serious game - trivial quiz

* Optional

↑ Highly Recommended

Appendix 6: Cases studies maps for FTP modules

This Map will be developed in “BUS-GoCircular training packs” for the packs designed.

More information about the project

http://www.busgocircular.eu/

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Colophon