



D4.1 Report on existing skill recognition methods that include circularity

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Executive summary

The overall aim of BUS-GoCircular was to address and overcome the challenges of the stimulation of demand for green energy skilled workforce, along with hands-on capacity building to increase the number of skilled professionals within the workforce across the value chain. This report explores how existing building certification schemes can accept the skills and competence certification developed by BUS-GoCircular as qualification criteria and how this was implemented in several cases at national levels.

The report starts with an analysis on how the BUS-GoCircular developed [Circular construction skills qualification framework](#) can be linked with standards on circularity in the built environment (such as SO/TC 323), Certification Schemes at EU level (such as BREEAM, LEVELS and LEED) and Certification / standardisation initiatives at national levels (such as France's Afnor XP X30-901, Britain's Bs 8001 and Dutch Het Nieuwe Normaal).

At country level the possibilities to integrate BUS-GoCircular results in existing skills and recognition registers have been explored. Including integration in existing CPD schemes and VET qualifications for different professions or occupations such as the CPD scheme for solar fitters, roof gardeners and green roofers.

List of acronyms and abbreviations

BIM: Building Information Model / Management

BUS: Build Up Skills

CRM: Critical Raw Materials

CPD: Continuous Professional Development

EAB: External Advisory Board

EoSL: End of Service Life

GPP: Green Public Procurement

KE: Key Elements

MGRFIE: Multi-functional Green Roofs, Façades and Interior Elements

ULO's: Units of Learning Outcomes

RES: Renewable Energy Source

WP: Work Package

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.

Critical raw materials: Those raw materials that are most important economically and have a high supply risk for the EU, as listed by the European Commission.

Focus group: A small subset of experts within the construction industry which have been brought in to assist in verification of the work we have completed.

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.

Skills Mapping: Mapping of skills levels from 0 to 5. This allows us to gauge the skills gap existing within any given profession.

- **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 three core key elements are:

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.

The five enabling key elements are:

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

The development of skills as defined and identified should be stimulated on both the demand and supply side. This is facilitated by the promotion of skilled professionals with the BUILD UP Skills advisor-app personal recognition of skills, so that they can be easily found by companies or clients. Another measure is to enable an increase of their demand by exploiting public sector levers. In order to increase the demand BUS-GoCircular has explored the possibilities to enrich / collaborate with existing building certification schemes. This with the goal to include acceptance of qualification criteria as stated in the skills and competence certification developed by BUS-GoCircular.

This report describes how in the in BUS-GoCircular developed [Circular construction skills qualification framework](#) can be linked with standards on circularity in the built environment (such as [ISO/TC 323](#)), Certification Schemes at EU level (such as [BREEAM](#), [LEVELS](#) and [LEED](#)) and Certification / standardisation initiatives at national levels (such as [France's Afnor XP X30-901](#), [Britain's BS 8001](#) and Dutch [Het Nieuwe Normaal](#)). This is done in chapters 1 and 2.

Furthermore at country level the possibilities to integrate BUS-GoCircular results in existing skills and recognition registers have been explored. Including integration in existing CPD schemes and VET qualifications for different professions or occupations such as the CPD scheme for solar fitters, roof gardeners and green roofers. This can be found in chapter 3.

2. Standardisation efforts

“In our ‘throw away’ society, the linear model of make, use and discard is depleting the resources of our planet – and our pockets. The solution is a circular economy, where nothing is wasted, rather it gets reused or transformed. While standards and initiatives abound for components of this, such as recycling, there is no current agreed global vision on how an organisation can complete the circle. A new ISO technical committee for the circular economy has just been formed to do just that” [\(Naden, 2019\)](#).

[ISO/TC 323, Circular economy](#), is made up of experts from over 65 different countries. It builds upon the French standard, [“XP X30-901 Circular Economy - Circular economy project management system - Requirements and guidelines”](#) that was published in 2018. ISO/TC 323, Circular economy, aims to cover all aspects of a circular economy including public procurement, production, distribution, end of life as well as wider areas such as behavioural change in society, and assessment, such as some kind of circularity footprint or index. The committee works on a set of internationally agreed principles, terminology, and a framework of what a circular economy is, and develops a management system standard. It also works on alternative business models and a method for measuring and assessing circularity.

Reference ↑	Title
ISO/TC 323/CAG ⓘ	Chair's Advisory Group
ISO/TC 323/STTF ⓘ	Spanish Translation Task Force
ISO/TC 323/WG 1 ⓘ	Terminology, principles, frameworks and management system standard
ISO/TC 323/WG 2 ⓘ	Practical approaches to develop and implement Circular Economy
ISO/TC 323/WG 3 ⓘ	Measuring and assessing circularity
ISO/TC 323/WG 4 ⓘ	Circular Economy in practice: experience feedback
ISO/TC 323/WG 5 ⓘ	Product circularity data sheet
Joint working groups under the responsibility of another committee	
Reference ↑	Title
ISO/TC 207/SC 5/JWG 14	Joint ISO/TC 207/SC 5 - ISO/TC 323 WG: Secondary materials

Figure 1: The ISO/TC 323 working group structure

Front-runners and followers do not need to wait

Organisations wanting to stand out as leaders in the field of circular economy management can adopt a circular economy management system and pending the release of the ISO TC 323 standard on circular economy management prepared by the ISO committee, can refer to the [“XP X30-901 Circular Economy - Circular economy project management system - Requirements and guidelines”](#) standard or the [British BS 8001:2017](#).

[XP X30-901 Circular Economy - Circular economy project management system - Requirements and guidelines](#) is a voluntary standard developed by the French Standardisation Association (AFNOR) that helps companies grasp the circular economy topic and implement projects that cover its many dimensions. The document proposes a grid or matrix laying out a common understanding of terms, principles and practices that all of the actors agree on. This matrix covers the three dimensions of sustainable development (environment, economy, society) and the seven areas of action of the circular economy:

1. Sustainable procurement
2. Ecodesign
3. Industrial symbiosis

4. *Functional economy*
5. *Responsible consumption*
6. *Extension of service life*
7. *Effective management of materials and products at the end of their life cycle*

The standard provides requirements for planning, implementing, evaluating and improving a circular economy project. Like other management system standards (ISO 9001, ISO 14001, etc.), it is based on the principle of continual improvement. It is intended as a guide for project managers, sustainable development managers or general managers as well as for local authorities, helping them reach their circular economy goals in every project.

Testimonials about how to implement the AFNOR standard can be found in [AFNOR Standardization. \(n.d.\)](#).

The standard [BS 8001:2017](#) is a framework for the application of the principles of CE in organisations, developed by the British Standard Institution (BSI) in 2017 (see Table 1). It guides organisations in the implementation of the principles of the CE to improve the management of their resources. The standard offers a methodology to develop, at least partially, a CE perspective, based on the following six principles:

1. *Systems thinking: Understanding the system-wide impacts of your activity.*
2. *Innovation: Rethinking resource management as a lens for value creation.*
3. *Stewardship: Taking responsibility for the ripple-effect impacts resulting from your decisions and activities.*
4. *Collaboration: Securing system-wide benefits by cooperating with others.*
5. *Value optimization: Keeping materials at their highest value and function.*
6. *Transparency: Being open and honest about circular barriers and benefits.*

3. Certification Schemes at EU level

The three certification schemes BREEAM, LEVEL(s), and LEED are the most prominent ones at the European level that integrate standards on circularity in the built environment. While other certification schemes focus on sustainability and environmental performance, they may not have as strong a focus on circular economy principles. Therefore, those three certification schemes are currently the most relevant certification schemes for circularity in the built environment at the EU level.

[BREEAM](#) (**Building Research Establishment Environmental Assessment Method**) was initiated by the Building Research Establishment (BRE), an independent research and consultancy organisation that specialises in the built environment based in the United Kingdom. BREEAM was first launched in 1990 as a method to assess and certify the environmental performance of buildings. Over the years, it has become one of the world's leading sustainability assessment methods for buildings covering different aspects.

It emphasises circularity through criteria such as material selection, reuse, and recycling, assessing projects based on their ability to minimise waste and maximise resource efficiency throughout the building lifecycle. BREEAM has started [integrating circular economy principles](#) into its assessment criteria, focusing on resource efficiency, material reuse, and waste reduction. The scheme evaluates aspects such as material sourcing, construction methods, and end-of-life considerations to promote circularity in building design and operation.

[LEVEL\(s\)](#) is an EU framework developed by the European Commission in 2017 in collaboration with various stakeholders, including industry representatives, researchers, and experts in the field of sustainable construction. It provides a common language for assessing the sustainability performance of buildings. It includes circularity indicators alongside other environmental aspects. Circularity indicators evaluate resource use, material efficiency, and lifecycle considerations to ensure buildings contribute positively to the circular economy.

[LEED \(Leadership in Energy and Environmental Design\)](#) was initiated by the U.S. Green Building Council (USGBC) and was created in 1998 by a group of architects and environmentalists who sought to establish a voluntary certification programme for green

buildings in the United States. LEED was developed to provide a framework for designing, constructing, operating, and certifying buildings that are environmentally responsible, resource-efficient, and healthy places to live and work. Since its inception, LEED has become one of the most widely used and recognised green building certification systems globally, with projects in over 180 countries and territories. While LEED originated in the United States, it has a significant presence in Europe and has been incorporating circular economy principles into its rating system, by encouraging the use of sustainable materials, efficient construction practices, and strategies for waste reduction during construction and operation and recycling, fostering a shift towards a more circular approach in building design and operation. It also emphasises the importance of design for disassembly and reuse.

As these certification schemes increasingly prioritise circularity in the built environment, they create a demand for professionals with expertise in sustainable building practices. This shift towards circularity necessitates a workforce capable of implementing innovative design, construction, and operation strategies that minimise waste and maximise resource efficiency. To meet this demand, training programmes and educational initiatives focused on circular economy principles are essential. By engaging in certification processes such as BREEAM, LEVEL(s), and LEED, professionals in the construction sector gain exposure to best practices and emerging trends in circular design and construction. This exposure not only enhances their skillset but also positions them as leaders in sustainable building practices, driving the industry towards a more circular and resilient future. Thus, these certification schemes play a crucial role in fostering the reskilling and upskilling of the construction workforce, enabling them to thrive in an increasingly circular economy-focused industry.

4. Experiences at National level

4.1. The Netherlands

In the Netherlands the Dutch BUS-GoCircular team engaged with [Het Nieuwe Normaal](#) (HNN).

“Years of experience with (pilot) projects show that circular construction is possible. A level playing field is needed to scale up. An unambiguous language with which both clients and contractors know where they stand is crucial. Otherwise we will continue to pilot side by side and reinvent the wheel. It is precisely clients and contractors who have taken the initiative to draw up an unambiguous language for circular construction: The New Normal.”

HNN is a framework aimed at the materials transition: it makes circular construction clear and concrete. The sustainable context of a circular project, such as energy, water and nitrogen, has also been taken into account and accelerators are also depicted. Circular construction is about a new way of working, experiences are shared about collaboration in teams and within the organisation. In this way, the connection is made with social themes such as reintegration and participation. The HNN framework covers 3 themes, which have been developed into indicators with which the circularity of a project can be determined.

1. Environmental impact

Addresses the total environmental impact, CO₂ emissions and CO₂ storage of materials.

2. Material use

Looks at the origin of materials, the proportion of healthy materials and the handling of residual materials during construction.

3. Value retention

Addresses the adaptive capacity, releasability and reuse potential.

Het Nieuwe Normaal aligns with the following initiatives at EU level.

- Ellen MacArthur
- BREEAM
- EN 15804 (MKI/MPG)

Level(s) EU

1.0 Thema	Indicator	Ontwerp- en bouwprincipe
Milieu-impact	MilieuPrestatie Gebouw (MPG)	Ontwerp en bouw met een zo laag mogelijke MilieuPrestatie Gebouw (MPG)
	Materiaalgebonden CO ₂ -uitstoot	Ontwerp en bouw met een zo laag mogelijke materiaalgebonden CO₂-uitstoot (<i>embodied carbon</i>)
	Materiaalgebonden CO ₂ -opslag	Ontwerp en bouw met een zo hoog mogelijke materiaalgebonden CO₂-opslag (<i>embedded carbon</i>)
Materiaalgebruik	Herkomst Materialen	Ontwerp en bouw met zo veel mogelijk materialen van verantwoorde herkomst : hergebruikt, gerecycled of hernieuwbaar
	Gezonde materialen	Ontwerp en bouw met zo veel mogelijk gezonde materialen
	Omgang restmateriaal bouw	Ontwerp en bouw met zo min mogelijk restmateriaal tijdens de bouw
Waardebehoud	Adaptief vermogen	Ontwerp en bouw met een zo groot mogelijke mate van adaptief vermogen
	Losmaakbaarheid	Ontwerp en bouw met een zo hoog mogelijke losmaakbaarheid
	Hergebruikpotentie	Ontwerp en bouw met een zo groot mogelijke hergebruikpotentie

Figure 2: Overview of HNN for buildings

Results of our analysis

HNN tests quite explicitly at the building/project level, somewhat at the organisational level (e.g. collaboration), but not at the people/skills level. This has two consequences:

1. The basic factors of the BUS-GoCircular framework are reflected quite well, all 3 core elements of the framework are addressed
2. The Enabling factors of the BUS-GoCircular framework are not properly addressed in HNN – we advised HNN to add supporting trainings and workshops to their support model addressing the Enabling factors. This to empower organisation to adapt their way of workings in order the design, build and maintain more circular.

Because HNN is not about selection or procurement of skills, but procurement of buildings, the focus is on all kinds of materials data from, for example, MPG and (in the case of energy) BENG calculations. Our ULO knowledge components do refer to legislation and, for

example, building passports, but not explicitly to regulations at national level. While that is precisely where the skill gaps will be (in other words, people have to learn to work with all measuring elements based on national regulation).

Circular skills in construction General framework			HNN Milieuimpact and Material use					Building flexibility		Handling residual material		Health
			MPG	Material-related CO2 emissions	Material-related CO2 storage	Material use	Potential for reuse	Adaptive capacity	Detachability	Demolition	Construction	Toxicity
#	Task	Subtask										
1	Prioritise	regenerative and efficient use of resources										
1.1		Design with bio-based, non-toxic and/or non-critical materials	1									
1.7		Source bio-based, reusable, non-toxic and non-critical materials	1									
1.8		Source local and lightweight materials	1									
2	Design for the future											
2.1		Design to reduce waste during production and use	1									
2.2		Design with materials that enable multiple uses					1	1	1			
2.3		Design buildings and installations that are made to last and to ensure longer use	1									
2.4		Design products and building structures to enable reuse and recycling	1									
2.7		Design modular construction solutions					1	1	1			
2.8		Design using secondary materials not initially intended for reuse	?							1	1	
2.9		Design to use and store energy more efficiently in buildings										
2.1		Compile and provide deconstruction / demolition specifications at the commissioning stage	?						1	1		
3	Assemble/construct for the future											
3.3		Reduce waste during production and construction	1									
3.4		Build modular structures					1					
		Build with bio-based, reusable, non-toxic and non-critical materials	1									
4	Rethink the business model											
5	Stretch the lifetime											
5.1		Manage and preserve biological products on construction site	1									
5.2		Maximise lifetime of products in-use	1									
6	Use secondary resources											
6.1		Reuse, repurpose or recycle secondary materials/components/resources from the same industry	1									
6.2		Reuse, repurpose or recycle secondary materials/components/resources from other industries	1									
6.5		Transform waste streams for reuse, repurpose, or recycle waste streams within the same industry (closed loop)	?						1	1		
6.6		Transform waste streams for reuse, repurpose, or recycle waste streams within other industries (open loop)	?						1	1		
6.7		Organise and provide guarantees for reused materials							1	1		
6.8		Disassemble modular structures							1	1		
7	Incorporate digital technology											
7.2		Employ material passports throughout each phase of the building/project	1									
8	Collaborate to create joint value											
9	Strengthen and advance knowledge											

Figure 3: Overview of Subtasks Described in BUS-GoCircular Linked to the 9 Key Elements of Circular Economy

In the table above an overview is given of the in BUS-GoCircular described subtasks linked to the 9 Key Elements of CE. The design principles are especially well connected and suitable for training in HNN. Although HNN focuses on design, the very important skills for implementing circularity in the construction value chain are not properly addressed. We advise HNN to refer to BUS-GoCircular for these additional skill requirements.

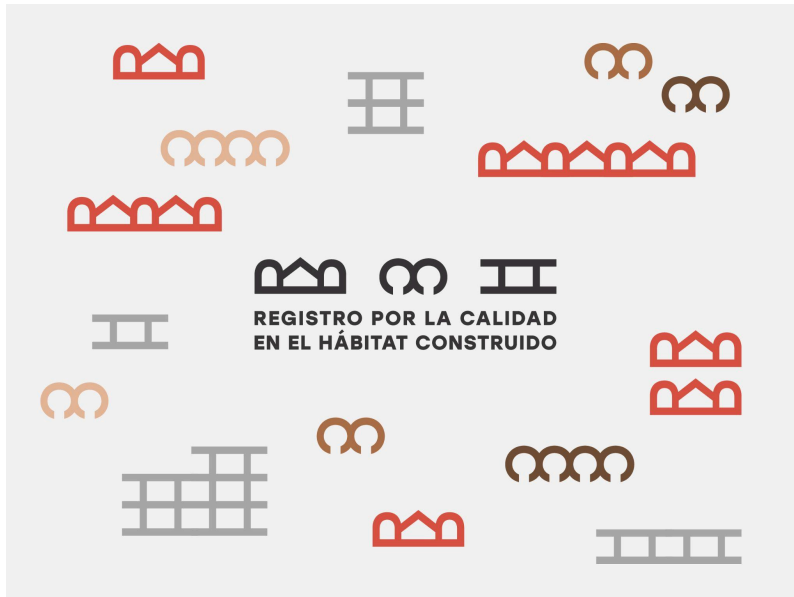
Integration in VET education

Integration of Circularity in VET education is an ongoing process. This process is guided by Foundation for cooperation on Vocational Education, Training and the Labour Market (Samenwerkingsorganisatie Beroepsonderwijs Bedrijfsleven, SBB). They develop the qualification structure and provide information about practice placements, work placements and the labour market. In 2022 they published the first advice on this topic. BUS-GoCircular participant Jan Cromwijk has participated in the advisory dialogues to draft this advice. More information in Dutch on [Energietransitie, circulariteit en klimaatadaptatie](#) and [keuzedelen en mbo-certificaten](#). Once circularity is embedded in the qualification structure as outlined above, VET-institutions can begin a process of translating general qualification requirements to specific learning targets and curricula. Through partners of BUS-GoCircular, such as the cooperative Leren voor Morgen, the learning targets specified by BUS-GoCircular are utilised to develop courses and learning materials that support this process and contribute to up-to-date VET-programs.

Integration in existing trainings

Integration in existing trainings is done as part of the Dutch training of trainers. They got practical exercises to do this integration.

4.2. Spain



In January 2022, IVE with the support of the Regional Government (Generalitat Valenciana) developed the "Registro para la Calidad del Hábitat Construido" (from now on, "Register CHC") which provides general information about professionals, products or examples of good practices in the field of construction.

This "Register CHC" is a recognition scheme where citizens can find accessible, transparent and free information through a website managed by IVE and supervised by the Generalitat Valenciana, which reinforces public confidence and trust.

The "Register CHC" contains the following three areas (with their corresponding validation protocols):

- Buildings and urban spaces
- Companies & professionals
- Products

In 2022, as objectives achieved in the National Implementation Plan (NIP) of Spain of the [BUSLeague project](#), the "Companies and professionals" area was created and two courses recognising the energy efficiency competences of professionals were added. To be

registered in this category and to be publicly recognised and displayed on the website, professionals took a course and passed an exam, among other requirements.

In general, the registration of these professionals is reviewed every 3 years. Complaints from citizens will be investigated and may result in the removal of the professional or company from the “Register CHC”.

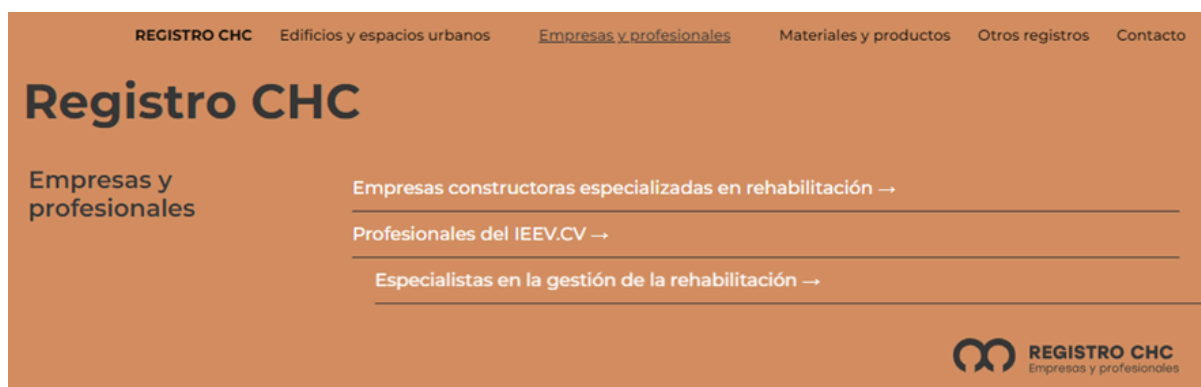


Figure 4: Companies and professionals area of the "Register CHC".

Currently, as part of the Spanish NIP of BUS-GoCircular, work is underway to create a list of environmentally friendly "circular" materials and products. This list will be available by mid-2024.

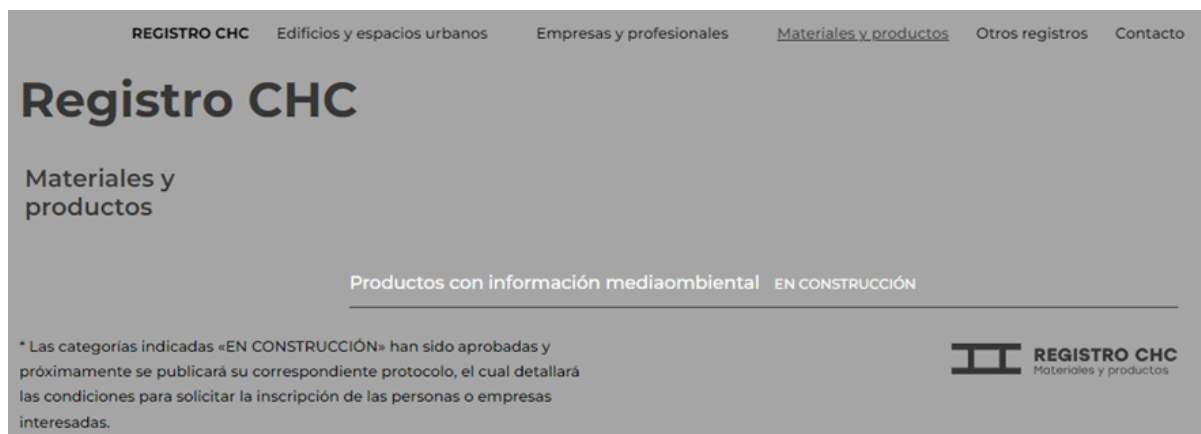


Figure 5: Products area of the "Register CHC".

In order to be included in the "CHC Register", manufacturers shall provide product information relating to:

- Recycled content (third party verified according to UNE-EN-ISO 14021)
- Recyclable
- Waste reduction
- Compostable
- Degradable
- Renewable

This information will be updated every 3 years. Complaints from citizens will be investigated and may result in the removal of the product from the "Register CHC".

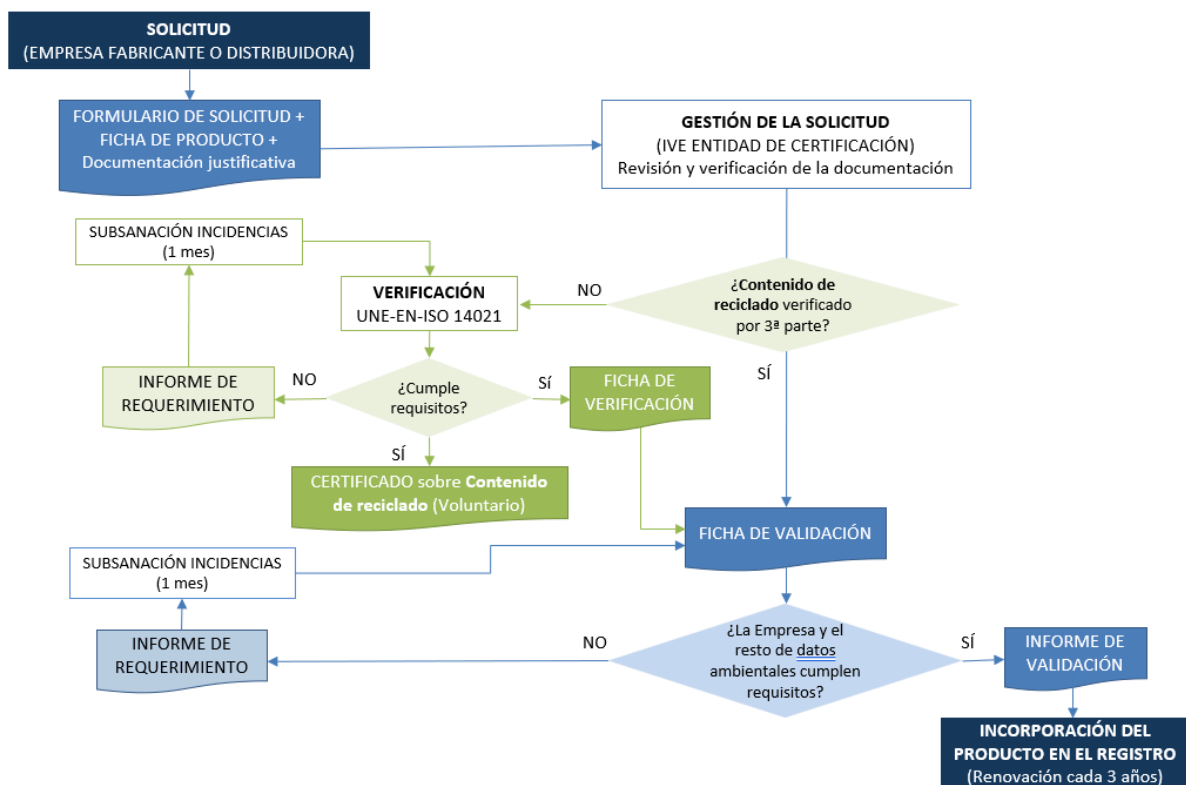


Figure 6: Flow to enter a product in the "Register CHC".

4.3. Ireland

IE: Development of at least 2 schemes for recognition or certification of circularity skills in the construction sector and facilitate training of at least 50 specialist workers/professionals under the schemes

The circular economy in construction qualification framework, designed through BUS-GoCircular, was eagerly anticipated in Ireland. TUS had included the engagement of relevant stakeholders in Ireland in the process in two ways, firstly through the BUS-GoCircular External Advisory Board which met online regularly to oversee the project's progress and ambition and through focus groups arranged to research and test the circular skills gap in the construction sector. Consequently 35 stakeholders in Ireland participated in the process of testing the skillset of a range of construction workers in 2022 through work profiled in greater detail in [D2.2 Mapping of Required Skills and Skill Gaps V.1.2 \(busgocircular.eu\)](#). The resulting skills gap analysis and qualification framework led to the development of a train the trainer programme and freely available circular content which was picked up by two certified training courses.

1. DASBE- NQF L8 (60 ECTS) Higher Diploma in Residential Energy Retrofit Management programme.

[Higher Diploma in Residential Energy Retrofit Management – DASBE | Ireland](#)

Content from BUS-GoCircular has been incorporated into this certified course along with the BUS-GoCircular Qualification framework which was utilised by the BUS-GoCircular Train the Trainer certified Course Coordinator.

The aim of the Higher Diploma in Residential Energy Retrofit Management programme is to upskill building professionals to develop knowledge and skills that allow them to design and deliver high quality, energy efficient retrofitting to existing buildings while complying with Ireland's latest Building Regulations. This will also place them in a position to contribute to meeting Ireland's climate action and energy targets in relation to green renovation of buildings. It will additionally boost demand for energy efficiency from householders and the

public sector by having a trusted industry professional/standard. The programme covers three main topics: Building Fabric, Building Systems, and Building Management.

The programme includes topics of building fabric, building systems and finance circular management. Each topic covers the understanding of energy efficiency related to the retrofitting of residential buildings and the use of sustainable materials and products. It is delivered part time over 3 semesters (1.5 years).

2. DASBE - NQF L7 (10 ECTS) Certificate in Green Procurement in Construction

[Certificate in Green Procurement in Construction – DASBE | Ireland](#)

The BUS-GoCircular learnings and content have been incorporated into the Circular economy elements of Green Procurement module. This programme is designed to upskill those working specifically in the field of green procurement in the built environment, applying efficient Green Procurement criteria and standards in order to better engage with green and energy challenges in construction works and consequently limit environmental impact, in a safe and sustainable manner.

This improved knowledge will allow professionals, staff members, employees, experts, and key players involved in procurement to apply their existing skills, so that relevant green procurement techniques, methods, and standards can be achieved.

Content on this training programme is as follows:

Module 1 Fundamentals of Green Procurement In Construction

- Green Procurement and Drivers
- Legal Aspects of Green Procurement
- Needs Assessment and Market Engagement
- Awarding Criteria
- Verification.

Module 2 Green Procurement Digital Tools

- EU Levels

- Introduction to Life Cycle Assessment (LCA)
- Introduction to Life Cycle Costing (LCC)
- Introduction to BIM and other Digital tools
- Monitoring Energy and Carbon Performance.

Home Performance Index Ireland - [Home Performance Index | Sustainable & Healthy Homes](#)

The Home Performance Index (HPI) is run by the Irish Green Building Council who hold a seat on the BUS-GoCircular External Advisory Group and significantly contributed to and enhanced the direction of delivery of BUSGoCircular in Ireland through advice and guidance offered freely through participation on the EAB in conjunction with other EAB members.

The Home Performance Index (HPI) Certification is Ireland's national certification scheme for new homes, similar to certification for commercial developments like LEED and BREEAM. Home Performance Index is independently assessed and awards certificates with a rating of HPI or Gold HPI for the standard of a home's design, construction and environmental sustainability

HPI certification is based on over 30 verifiable indicators in five categories. Mandatory requirements are set in the most important areas, such as water efficiency, ventilation, thermal bridging, and enhanced airtightness. For each level, mandatory performance standards in certain indicators must be achieved, in addition to the required score. The applicant is required to demonstrate that homes are designed to meet minimum performance levels in certain indicators which may exceed standard building regulations.

The training accompanying the certification for providers comprises three aspects.

1. Review materials provided 3 days in advance of the training
2. 3. x 2 hour interactive webinars in use of Home Performance Index and associated tools.
3. Completion of practical assessment based on a set of evidence provided.

HPI have confirmed that BUSGoCircular training content will be incorporated into training offered under the certification scheme.

All-Ireland Circular Built Environment Collective

TUS has been invited through its work in BUSGoCircular to participate in an all-Ireland Circular Built Environment Collective to create a collaborative space across higher education to share and explore the synergies between ongoing education and research activity. Instigated by Atlantic Technological University (ATU) and its work on the Build360 project, the initiative will host its first online meeting of all invited stakeholder at the end of February 2024. As its first action, the initiative is seeking to develop a National Forum for the Enhancement of Teaching and Learning in Higher Education Digital Badge on 'An Introduction to Education for a Circular Built Environment', which will target higher and further education staff, see announcement <https://www.teachingandlearning.ie/2023/12/20/minister-simon-harris-announces-new-upskilling-courses-for-staff-in-higher-education/>

3.1. Bulgaria

In Bulgaria, there are no formally approved or actively applied certification schemes in the field of circular construction; neither there are acting schemes on the key elements of the project as green roofs, façades or interior elements. Occasionally, contractors and foreign investors require their projects to be certified under any of the internationally recognized schemes (mentioned above). In the current state educational standards for the relevant professions, there are hardly any indications for circular approaches to building design and construction, while at the same time there is growing demand for professionals that can address the topic at each stage of the investment process.

Financial schemes for sustainable buildings

During the [SMARTER Finance for Families initiative](#), a certification scheme for sustainable buildings has been developed for several markets across east and south-east Europe, including Bulgaria. The framework of the scheme is voluntary based and aimed at supporting financial institutions, buyers and contractors alike in the acquisition of residential projects in new and renovated buildings. It has been developed and adapted to the Bulgarian national context by EnEffect (see here:

<https://www.eneffect.bg/en/projects/16/smarter-finance-for-families>). Since the validation and formalization of the scheme, several conversations and discussions have been led with financial and bank representatives, however, with no success until now. Banks in Bulgaria are currently focusing on the energy efficiency of buildings for which unfortunately there is still no readily available and reliable information in national registries. The scheme itself includes criteria on climate-adaptive and circular buildings, in support of two of the Environmental objectives of the EU Taxonomy. Still, for now, the scheme remains unused, however stringier requirements in relation to EU Taxonomy and ESG reporting are being introduced and may soon present new opportunities for integration of the scheme.

Integration in higher education for building engineers

The need for integration of circular criteria into higher education is identified as an integral to enable successful transition of the construction sector. An opportunity arose in spring of 2022 to organize a course on circular economy at the University for Architecture, Civil Engineering and Geodesy which brought a collaboration between the Institute for Circular Economy (ICE) in Bulgaria and EnEffect. Consequently, the elective course on [Circular models in construction](#) has been initiated for the winter semester 2022-2023. The course was prepared for two-hour 15 lectures (and exercises), lasting throughout the semester and intended for students of Architecture, with 4 ECTS to gain after successful completion.

ЕВРОПЕЙСКА СИСТЕМА ЗА ТРАНСФЕР НА КРЕДИТНИ ЕДИНИЦИ (ECTS) ИНФОРМАЦИОНЕН ПАКЕТ										EUROPEAN CREDIT TRANSFER SYSTEM (ECTS) INFORMATION PACKAGE	
V семестър										Semester V	
Архитектура										Architecture	
Идент. No на курса Course Id	Сигнатура Code	Учебна дисциплина	лек. lect	ур. сем. sem	В+У L+S	самост. работ. self pr.	Обща работност Total	ECTS	оценяване assessment (°)	Subject	Notes
■ Задължителни курсове											Compsulsory courses
> 031.00	URBLbCBA	Градостроитство	45		45	45	90	3	к(к)	Urban Planning	
032.00	ITAlbCBA	Компютърни технологии в архитектурата - I част	45	45	45	90	3	то(с)	Information Technologies in Architecture - Part I		
033.00	HBGAbCBA	История на българската архитектура	30	30	60	60	120	4	к(к)	History of Bulgarian Architecture	
034.00	RBLDP1bCBA	Жилищни сгради - I проект	90*	90*	90*	180*	6*	ан(пр)	Residential Buildings - Project I	for 1/2 of streams	
035.00	PBLDP1bCBA	Обществени сгради - I проект	90*	90*	90*	180*	6*	ан(пр)	Public Buildings - Project I	for 1/2 of streams	
036.00	AGBLbCBA	Аграрни сгради	30	30	30	60	2	к(к)	Agrarian Buildings		
037.00	AGBRbCBA	Аграрни сгради - проект	45	45	45	90	3	ан(пр)	Agrarian Buildings - Project		
038.00	URBP1bCBA	Градостроитство - I проект	90	90	90	180	6	ан(пр)	Urban Planning - Project I		
039.00	IBLDLbCBA	Индустриални сгради	30	30	30	60	2	>	Industrial Buildings	>	
040.00	ASLbCBA	Архитектурни конструкции	30	30	30	60	2	>	Architectural Structures	>	
041.00	PLNDLbCBA	Паркове и ландшафтна архитектура	30	30	30	60	2	к(к)	Park and Landscape Architecture		
042.00	TISbCBA	Технически инсталации и системи	30	30	30	60	2	к(к)	Technical Installations and Systems		
Общ студентско натоварване и кредити за семестъра от задължителни курсове			225	300	525	525	1050	35	Total students' workload and credits per semester from compulsory courses		
■ Задължителни курсове (по дисциплина по избор)											Compsulsory courses (on subject by student's choice)
> 011.02.01	SPObFBA	Физическо възпитание и спорт	30	30		30	1	>	Physical Education and Sport	>	
ОБЩО			225	330	555	525	1080	36.0	TOTAL		
■ (+) Факултативни курсове											(+) Free choice courses (optional)
012.03	CMbCbFBA	Кръгови модели в строителството	20	10	30	90		4	ан(пр)	Circular Models of Building Construction	
012.02	INbGbCBA	Информатика в архитектурата	30	30	30			4	то(с)	informatics in architecture	

Легенда: Кредитите точки от факултативните курсове са допълнителни и не се включват в сумата от задължителните
 (°) Оценка/Assessment, к(к)-контрикт, и(с)-изпит+текуща оценка/continuous examination, ан(пр)-сагнати на проект/project presentation, з(п)-за-от-пос-ва-ил, то(с)-текуща оценка/continuous assessment, (>) продължава/contin
 УЧЕБЕН ПЛАН 2023/2024 версия за печат

Figure 7: [Announcement](#) in the academic curriculum for 5th semester students of Architecture at UACEG

The topics of the 15 lectures were organized as follows:

1. Introductory lecture- "Who am I?" What is the living thing.
2. Economic models. Linear and circular economy. Doughnut economics (theory).
3. Climate crisis and a socio- economic crisis. Empowerment exercise (theory and exercise).
4. Synergy in Symbiosis. Nature as an idol. Benefits in natural behaviours (theory).
5. Biomimicry. Biomimicry in architecture (theory and exercise).
6. Sustainable cities. Urban cycles and waste streams. Cities as material banks (theory).
7. Zero- waste design and Life cycle of buildings (theory).
8. Principles of circular economy in construction. Different applications and examples (theory).

9. Key elements of circular economy. Energy efficiency as part of the circular economy (theory).
10. Tools and approaches for sustainable design and architecture. Bioclimatic design. LCA and EPD. BIM and material passports (theory and exercise).
11. EU and national legislation. Frameworks for energy efficiency and circular economy. Examples (theory).
12. Seminar lecture. Guidance on final evaluation projects (exercise)
13. Seminar lecture. Guidance on final evaluation projects (exercise)
14. International and European certification schemes for sustainable building projects (theory).
15. Final presentations. Discussion and evaluations.

For lectures 8, 9 and 10 – materials from the BUS-GoCircular developed training content have been used.

The course was repeated in the winter 2023-2024 semester (image above). It is planned to continue in the following winter semester, this time opening it also to the faculty of civil engineering.

Proposal for a Continuing Professional Development scheme

Within the BUILD UP Skills initiative, a project for improving the qualification of the construction sector in Bulgaria has been initiated. A consortium of stakeholders, coordinated by EnEffect, has united to work on “National Roadmap to integrate trainings on intelligent energy solutions for buildings in the mainstream curricula and practice of building professionals and increase the number of skilled workers and professionals to reach the national 2030 targets in the building sector, briefly known as [BUS BG 2030](#).

Among the proposals for providing market stimulation and development of the total academic system for professional and higher education is the establishment of a Continuing Professional Development framework for upskilling construction specialists. A certification scheme is being suggested targeted to professionals with qualification “Construction Technician” and suitable for professionals from EQF3-4 to EQF 6-7. The proposed scheme contains 12 modules focusing on energy efficiency, sustainable design of nearly zero energy

buildings (nZEB) with low ecological footprint and digital planning. To support creation of the content of Module 2 *Reduced ecological footprint*, results from WP3 of the BUS-GoCircular project were used.

3.2. Czech Republic

Circular economy at the level of the Czech Republic requires a strategic comprehensive approach. In December 2021, the Government therefore approved the Circular Czech Republic 2040 Strategic Framework ("Cirkulární Česko 2040"), the first comprehensive strategy for the circular economy in the Czech Republic. The elaboration of the strategy reflects the necessity to promote the principles of the circular economy in the Czech Republic and highlights the circular economy as a priority for the Czech Republic. The purpose of the Strategic Framework of the Circular Economy of the Czech Republic 2040 is to formulate the assumptions, objectives and measures for the Czech Republic to be resilient to future environmental threats, including climate change, and to develop an overall sustainable social system through the circular economy. The Czech Republic must be able to respond to future major challenges, including those related to natural disasters or pandemics, etc.

The Strategic Framework focuses on 10 priority areas: Products and Design, Consumption and Consumers, Waste Management, Industry, Raw Materials, Construction, Energy, Bioeconomy and Food, Circular Cities and Infrastructure, Water, Research, Development and Innovation, Education and Knowledge, and Economic Instruments. The vision of the Circular Czech Republic is to achieve a state where the circular economy brings substantial environmental, economic and social benefits to the Czech Republic.

Education and knowledge is one of the priority areas. The transition to a circular economy requires a skilled workforce with specific and sometimes new skills. The development of environmental knowledge, skills and attitudes has, in addition to benefits in personal and civic life, positive impacts in professional life and is ultimately a prerequisite for increasing the competitiveness of the Czech Republic, as Czech businesses and companies need sufficient human resources to be able to respond flexibly to the introduction of

environmentally friendly technologies and eco-innovations in industry and construction in the future.

Goal: The transition to a circular economy will create at least 50,000 new jobs (approximately 1% of current employment) by 2040. The circular economy as a concept is firmly integrated into the entire education system.

Principles:

- The integration of the circular economy into education at all levels is promoted.
- Relevant information on the circular economy is widely available in education.
- Actors in the circular economy are connected and share information across the value chain.
- Information support for the circular economy is continuous.
- Circular economy knowledge and competences are enhanced.

Measures:

1. Promote the development of knowledge on the circular economy at all levels of the education system and the integration of the circular economy into educational programmes.
2. Motivate primary and kindergarten schools to integrate the circular economy into their curricula, and support the development of teaching programmes and materials on the circular economy.
3. Promote technical and creative fields of study in circular economy areas.
4. Improve awareness-raising campaigns on the circular economy.
5. Promote residents' knowledge of waste prevention in households. (especially textiles, food, furniture, books, packaging).
6. Strengthen the practical application of circular economy knowledge.
7. Raise awareness of the quality and safety of repaired, refurbished or repaired and remanufactured products and their environmental benefits in terms of waste prevention.
8. Combat food waste through awareness-raising campaigns, educational programmes, theoretical and practical workshops, web-based tools and best practice guidelines.
9. Create awareness-raising campaigns, strengthen capacity building initiatives and encourage in-house repairs to extend the life cycle of products.

10. Improve awareness-raising and education campaigns to reduce the impacts of textile purchasing, use and disposal.
11. Create campaigns to raise awareness on the part of entrepreneurs and investors of the opportunities presented by new circular business models.
12. Raise awareness of the business opportunities presented by new circular and digital business models.
13. Promote cooperation between companies and educational institutions at different levels, including teaching, internships/externships and participation in (research) projects in the circular economy.
14. Encourage the creation of circular economy hubs at national, regional and municipal level to facilitate the promotion of the circular economy and the sharing of information along the value chain.
15. Use all information channels to disseminate information on the circular economy.
16. Improve the linking of the sub-strategies of the CR with circular economy information.
17. Prepare and announce annually coordinated and complementary programmes to support the delivery of verified programmes.
18. Develop and link platforms for sharing information on the circular economy.
19. Ensure that the circular economy is effectively embedded and included in existing or emerging strategic documents at all levels.
20. Ensure functional and effective communication on circular economy: at ministerial level.
21. Create a summary and signposting of possible voluntary tools for businesses and the non-profit sector.
22. Stakeholder platform - use existing structures to link education and circular economy issues.
23. Provide training for public procurers to promote sustainable use of resources in public procurement.

Czech Republic 2040 Strategic framework in the field of education, creates space for a broad application of the BUS-GoCircular project outputs.

BUS-GoCircular's Qualification framework is and will be used in the project proposals coming from Czech Technical University and then their realisation within the National Recovery Plan programme in the current call aimed at universities: Promoting Green Skills

and Sustainability in Universities. In this call there are several appropriate areas: Newly accredited programmes in the field of green transformation, New/innovated courses in existing curricula in the field of green transformation and lifelong learning courses. There is a proposal for innovation of courses for the three study programs - Civil Engineering, Architecture and Building Science, Construction Engineering. Another proposal is two lifelong learning courses, based directly on BUS-GoCircular material and aimed at interdisciplinary and different levels of expertise. This should be realised in the following two years.

At organisation Rethink Architecture, the mission is to inspire, educate and connect architects and investors in the design and construction of sustainable buildings and neighbourhoods. They present the principles and benefits of sustainable architecture in all three pillars of sustainability: environmental, economic and social. A multi-disciplinary team of experts organises lectures, publishes e-books and conducts educational workshops on sustainability for companies and the public. Members of the organisation participated in the 1st TtT course of BUS-GoCircular project and they have already implemented BUS-GoCircular qualification framework and project outputs into their training offers.

The Czech Chamber of Authorised Engineers and Technicians Working in Construction (ČKAIT) is a public organisation established in 1992. Among other things, the organisation provides lifelong learning courses for its members. Lifelong learning is an essential prerequisite for a high professional level of activity of authorised persons and their professional growth. It is not a one-off process ending with leaving school. The requirement for lifelong, continuous updating and expansion of knowledge arises from the faster pace of new knowledge and the obsolescence of previous knowledge. Several new courses are being incorporated into the lifelong learning offer in the following time. The providers are either companies that were represented in TTT courses or are members of the Czech EAB of BUS-GoCircular project. For example: online course Bisolar roofs (provided by Czech Green Building Council), series of courses on Smart Renovation (provided by Centrum Pasivního Domu).

3.3. Croatia

In Croatia, Croatian BUS-GoCircular team collaborated with different stakeholders responsible for recognition of skills, running existing or developing new training programmes as well as those stakeholders defining policies in educational as well as construction sectors.

National policies and strategies related to green skills and jobs

The National Action Plan for Development of Green Skill Jobs Related to Energy and Post-Earthquake Reconstruction (Ministarstvo prostornog uređenja graditeljstva i državne imovine, 2022) was adopted in Croatia. As part of the National Recovery and Resilience Plan 2021 - 2026 (hereinafter referred to as: NPOO), initiative 6. Building renovation has been set aside, which refers to energy renovation of buildings and support for the process of renovation, reconstruction and revitalization of areas affected by earthquakes, i.e. renovation through seismic strengthening and energy efficiency, but also through the "*build back better*" model, i.e. energy renovation of the building stock compared to the state before the earthquake. As an obstacle to the successful and intensive implementation of such an extensive process, the NPOO recognized the lack of a large number of workforce with professional competences for adequate and high-quality implementation of complete renovation, especially the necessary knowledge and skills in the segment of energy efficiency, anti-seismic renovation, application of solutions based on nature, green infrastructure and circular management of space and buildings, as well as the knowledge and skills required for an adapted approach to the restoration of cultural heritage. Therefore, through NPOO, the creation of the **National Action Plan for the development of skills in the context of green jobs related to energy renovation and post-earthquake reconstruction** was initiated, in which context the reform *C6.1.R2 Development of a framework to ensure adequate skills in the context of green jobs required for post-earthquake reconstruction* is essential. This reform, in terms of improving the knowledge and skills needed for the labour market, is complementary to other reforms within the NPOO, namely reform *C4.1. Improvement of employment measures and the legal framework for the modern labour market and economy of the future* (through the contribution

to the employability of the workforce) and the reform C3.1. R2 *Modernization of higher education (through improvement of educational programs)*.

The goal of creating the National Action Plan (Ministarstvo prostornog uređenja graditeljstva i državne imovine, 2022) was to provide a basis for increasing knowledge and strengthening skills in the context of green jobs related to the process of energy restoration and post-earthquake reconstruction and, accordingly, to enable the necessary retraining and education of the workforce. It is said that the national plan will improve green skills in the context of energy renovation, post-earthquake reconstruction, green infrastructure, application of solutions based on nature and circular management of space and buildings, based on the review of existing programs and the creation and adaptation of educational programs. That is, it will be possible to improve educational programs and strengthen the professional competencies of the workforce for the renovation of buildings in the segment of energy efficiency, anti-seismic renovation, application of solutions based on nature and circular space management.

Since the lack of a large number of workers with professional competences has been recognized, this plan provides the basis for increasing and improving knowledge and skills in the context of green jobs related to the process of energy renovation and reconstruction after an earthquake, and improves green skills in the same context, and defines activities related to higher education, lifelong education and connecting education and the labour market.

At the beginning of 2023, the Agency for Vocational Education and Training and Adult Education (AVETA) published newly developed programs for the acquisition of green skills, which are available for download by interested educational institutions. So far, 7 education programs have been published for the acquisition of micro-qualifications in the following areas of building sector: Connection and commissioning of heat pumps, Installation and connection of solar thermal systems and collectors, Installation and connection of biomass boilers, Maintenance of biomass boilers, Maintenance of solar thermal systems, Environmental protection in the maintenance of residential and commercial buildings, Maintenance of power electronics for renewable energy sources.

In Croatia, there is a Database of certified installers of renewable energy sources (at <https://einstalaterioie.mgipu.hr>) for monitoring the qualification program for installers of

renewable energy systems in the field of photovoltaic systems, solar thermal systems, shallow geothermal systems and heat pumps and smaller boilers and biomass stoves, as well as training program providers authorised by the Ministry of Physical Planning, Construction and State Assets. Currently, only 545 certified installers of renewable energy source systems for photovoltaic systems are registered in the Database, while the database is empty for other installers.

In relation to this, there are four Ordinances on conditions and standards for determining the quality system of services and works for the certification of installers of renewable energy sources, each Ordinance for one of the mentioned areas, namely:

- Ordinance on conditions and standards for determining the quality system of services and works for the certification of installers of renewable energy sources – photovoltaic systems (Ministarstvo graditeljstva i prostornoga uređenja, 2015).
- Ordinance on conditions and criteria for determining the quality system of services and works for the certification of installers of renewable energy sources – solar thermal systems (Ministarstvo graditeljstva i prostornoga uređenja, 2017a).
- Ordinance on conditions and criteria for determining the quality system of services and works for the certification of installers of renewable energy sources – smaller boilers and biomass stoves (Ministarstvo graditeljstva i prostornoga uređenja, 2017b).
- Ordinance on conditions and standards for determining the quality system of services and works for the certification of installers of renewable energy sources - shallow geothermal systems and heat pumps (Ministarstvo graditeljstva i prostornoga uređenja, 2017c).
- Ordinance on education and certification system of construction workers working on the installation of building components which affect the energy efficiency of buildings (Ministarstvo graditeljstva i prostornoga uređenja, 2017d).

DGNB activities (Deutsche Gesellschaft für Nachhaltiges Bauen or German Sustainable Building Council)

After several years of experience in the implementation of numerous projects, educations and workshops aimed at increasing knowledge and awareness of sustainability, the Croatian

Green Building Council has decided to further engage around the development of a methodological framework by which it would be possible to objectively confirm the sustainability of buildings and the built environment in Croatia. Considering that only the DGNB System is one of the widely recognized and recognized sustainability assessment tools developed in the European Union in compliance with the regulatory framework of the European Union, including the EU Taxonomy and ESG principles, the Croatian Green Building Council decided that the DGNB system is the one that is optimal for creating a Croatian sustainability rating system.

The DGNB System consists of two key elements that guarantee its objectivity:

Methodological Framework:

- Pre-defined and unique criteria and indicators with threshold values and intermediate values and with assessment methodology

Objectivized, Adapted to the Audit Evaluation System:

- Accreditation system of auditors - those who check success in achieving indicators
- Accreditation system of certification body - those who control and confirm the performed verification

The DGNB system refers to the contractor's skills and qualifications primarily within the criteria related to the "Process Quality" aspect. In the DGNB system, the Process Quality criterion assesses how effectively the planning and construction processes are managed to achieve sustainability goals. This includes considerations for the skills and qualifications of the professionals involved in the building process.

Here are some aspects related to contractor's skills and qualifications that may be considered within the DGNB system:

- **Expertise in Sustainable Construction Practices:** Contractors with expertise in sustainable construction practices, including knowledge of eco-friendly materials, energy-efficient construction methods, and waste reduction strategies, may contribute positively to the DGNB assessment.

- **Qualifications of Construction Workers:** The qualifications and training of the construction workforce may be assessed. This includes ensuring that workers have the necessary skills to implement sustainable building practices on-site.
- **Compliance with Standards:** The DGNB system often considers compliance with relevant standards and certifications. Contractors with certifications related to sustainable construction or environmental management may receive favourable assessments.
- **Experience in Green Building Projects:** Contractors with a proven track record in successfully delivering green building projects may be acknowledged for their experience and expertise.
- **Innovation and Continuous Improvement:** The DGNB system may value contractors who demonstrate a commitment to innovation and continuous improvement in sustainable construction methods.
- **Environmental and Social Responsibility:** Contractors may be assessed on their commitment to environmental and social responsibility, such as minimising the environmental impact of construction activities and ensuring fair labour practices.

The BUS-GoCircular project's results, particularly the developed units of learning outcomes and upskilling in circular economy, can be highly relevant to be used for training contractors as well as designers that are going to design and construct future DGNB rated buildings. In the view of using the DGNB system for future rating of buildings in Croatia as announced by Croatian Green Building Council, Assoc. prof. Bojan Milovanović (a BUS-GoCircular participant) became a member of the Professional-Scientific Committee of Croatian Green Building Council, which consists of a group of national experts. This is one of the steps which would enable the implementation of BUS-GoCircular project results in future training programmes.

Integration in existing trainings (HEI and CPD)

Integration in existing trainings is done as part of the Croatian training of trainers where trained trainers are mainly (but not exclusively) coming from HEI organisations. It is planned that these trainers will in future use developed ULOs and learning outcomes for the modification of existing faculties courses and create new courses. The process of integration

into existing faculty courses as a result of the BUS-GoCircular project is already well underway as the project outcomes are being used in existing courses like Building Physics as well as newly developed courses like “Green Building” and “Energy renovation of buildings” that were held for the first time in the spring semester of 2023. Additionally, topics related to circular economy (from waste, energy, water, sustainable materials to ESG) are included into the bachelor theses as well as master theses thus proving that mentoring process developed within the BUS-GoCircular project is also being successfully transferred into daily University practice.

Furthermore, outcomes of the BUS-GoCircular project have also been successfully implemented into continuous professional development (CPD) programmes run by Croatian Chamber of Civil Engineers (HKIG) and Croatian Chamber of Architects (HKA) as well as of Croatian Green Building Council (CGBC) and Faculty of Civil Engineering University of Zagreb. For example, HKIG is regularly (bimonthly) running the CPD course (a webinar) on “Introduction to green buildings” which includes a variety of topics on circular economy and specific topics such as multifunctional green roofs, LCA, environmental impact of the buildings in their whole life cycle, sustainable materials, management of space and buildings in cities, development of green infrastructure in urban areas, etc. Assoc. prof. Bojan Milovanović (a BUS-GoCircular participant) from the University of Zagreb, Faculty of Civil Engineering is regularly lecturing on this CPD course and implements BUS-GoCircular ULOs and developed training materials in it. Similar is done at HKA, whereas HKA is organising the CPD course (a webinar) on “Introduction to green buildings” organises a CPD course on “Introduction to green buildings” much less frequently. BUS-GoCircular participants from the Faculty of Civil Engineering University of Zagreb created a CPD course called “Green Buildings” and several separate courses dealing on specific aspects of circular economy (waste, water, energy, renovation, indoor environment quality etc.).

Integration in VET education

Integration of Circularity in VET education is an ongoing process. The Croatian National Qualifications Framework (NQF) is a reform instrument that regulates the entire system of qualifications at all educational levels in the Republic of Croatia through qualification

standards based on learning outcomes and harmonised with the needs of the labour market, the individual and society as a whole.

Prof. Ivana Banjad Pečur (a BUS-GoCircular participant) from the University of Zagreb, Faculty of Civil Engineering, is a member of the Construction and Geodesy sector council. Sector councils are advisory and expert bodies that take care of the development of human resources in accordance with the needs of the labour market within individual sectors. They:

- carry out **evaluation of proposed sets of learning outcomes, occupational standards and qualification standards;**
- **analyse the existing and necessary competencies within the sector;**
- They make recommendations to the National Council on enrollment policy, enrollment quotas and financing of qualifications from public sources, according to qualifications and according to counties;
- to the ministry responsible for education and science, they make recommendations for changes in qualification standards based on observed changes in occupational standards;
- make recommendations for changes in the National Classification of Occupations to the ministry responsible for work;
- They propose recommendations for the development of the sector to the National Council;
- monitor and analyse the implementation of the recommendations given to the National Council;
- propose an annual work plan and submit reports on the execution of the plan to the National Council.

Thus, through her work in both BUS-GoCircular and sector council for Construction and Geodesy prof. Banjad Pečur is improving the learning outcomes, occupational standards and qualification standards towards a circular economy.

3.4. Hungary

Embedding results in at least 2 schemes for recognition of circularity skills in the construction sector

Currently, Hungary is going through a circular transition that requires a complex and holistic approach.

In **2022** the Hungarian government launched two funding opportunities targeting mainly SME's:

- [Környezeti és energiahatékonysági operatív program plusz \(KEHOP PLUSZ\) \[Environmental and Energy Efficiency Operational Programme \(EEEOP Plus\)\]](#)
- [GINOP_PLUSZ-1.3.1-21 „Zöld nemzeti bajnokok” – A zöldgazdaság területén működő mikro-, kis- és középvállalkozások technológia fejlesztésének támogatása \[EDIOP Plus-1.3.1-21 “Green national champions” - Support for technological development of micro, small and medium enterprises operating in the field of green economy\] to enhance circularity.](#)

In **March 2023** the highlights of the National Circular Economy Strategy of Hungary were published. The OECD has been supporting Hungary's Prime Minister's Office in developing a national circular economy strategy and an action plan through analytical work and a stakeholder consultation process.

The OECD developed a set of key elements for the future strategy in transitioning to a circular economy in Hungary. They also prepared an in-depth analysis of a set of priority areas that are deemed critical to the Hungarian circular economy transition – biomass and food, construction and plastics, as well as cross-cutting horizontal tools – and suggested 45 policy recommendations and specific implementation actions to help achieve circular potential in these areas in the short, medium and long term.

Construction is one of the three priority areas and high-impact actions that are deemed critical to the Hungarian circular economy transition.

Hungary also has a **Circular Economy Technology Platform** (KGTP - Körforgásos Gazdaság Technológiai Platform) which has a vision of socialising the circular economy

through the creation of educational materials, training programmes and awareness-raising and behaviour change activities. The platform is entirely voluntary and the members are forming working groups to cooperate in their work to the best of their knowledge and experience and to improve Hungary's competitiveness in the field of the circular economy.

Integrating circular skills in HEI

In the previous years and presently in the Hungarian higher education circular economy is not a stand alone course or subject, however in some institutions it starts to gain significance and certain elements are introduced to the curricula.

In September 2024 University of Pannonia will provide circularity focused trainings as follows:

Faculty / specialised	Language	Level	Schedule
Sustainable and circular tourism	English	BS	Full-time education
Sustainable and circular tourism	English	BS	Correspondence training
Circular economy management	English	MS	Full-time education
Circular economy management	Hungarian	MSc	Correspondence training
Circular economy design and development engineering	Hungarian	MSc	Correspondence training
Circular economy design and development engineering	Hungarian	MSc	Correspondence training

Table 1: Integrating Circular Skills in Higher Education: University of Pannonia's Initiatives

ÉMI is in collaboration with several universities: Budapest University of Technology and Economics, University of Sopron, University of Győr, University of Miskolc, University of Pécs.

Dr. Anita Terjék and dr. Károly Matolcsy both teach at Budapest University of Technology and Economics and both introduced the circular skills to the students during mentoring and pilot courses.

Dr. Anita Terjék (senior researcher at ÉMI and associate professor at Budapest University of Technology and Economics) had mentees studying Civil Engineering MSc.

The 5 Hungarian students attended the mentoring course from February to June within the framework of the subject „Building Construction” in Budapest where they gained knowledge on the most relevant topics related to circular economy.

The mentoring course introduced the following topics:

- Energy efficiency and environmental awareness in architecture, Life-cycle assessment
- Prefabrication and modular construction, Smart building – case studies
- Regulatory environment and building conditions, conformity assessment in the construction sector
- Innovation and circularity in construction, materials and technologies for sustainability

The mentees were satisfied with the course, they acquired useful knowledge in the above mentioned topics. In addition to the appropriate use of building materials, the lectures also focused on usability at the end of the life cycle, highlighting strategies for increasing circularity (9R), environmental awareness, and ecological aspects of construction. The students got acquainted with the LCA methodology, the importance of EPD and the impact of digitization trends in order to improve the efficiency of the sector. An interactive lecture on the basics of the digitalization of the plant construction industry took place with the cooperation of Nethod Kft., where the students could also get to know the chosen software.

Dr. Károly Matolcsy held an introductory training for students focusing on the basics of circular economy.

Both trainings were an opportunity to start integrating circularity in the curricula at Budapest University of Technology and Economics.

ÉMI signed 5 memorandum of understanding documents with different institutions, mainly manufacturers. Two of them also teach at higher education institutions, Zoltán Pásztory (Woodspring Ltd.) teaches at University of Sopron and Gábor Lekics (Lekics Mérnökiroda Ltd.) teaches at University of Győr.

They both validated the training module developed by ÉMI (Module 2: Build to close the loop of materials) and are interested in integrating this module and others focusing on circular economy into their future curricula.

Integrating circular skills in VET

ÉMI has strong collaboration with vocational education institutions resulting from previous BUILD UP Skills projects (BUSH, TRAINBUD, ConstructSkills4LIFE) coordinated by ÉMI. We have joint projects with Békéscsaba Vocational School.

Introducing circularity on a VET level is a challenge in Hungary. Practitioners have basic knowledge related to circularity or they are aware of the subject, yet they are not competent enough.

In summary, while building energy strategies emphasise the importance of education and training, the strategies lack specific objectives for energy efficiency and circularity, despite prioritizing the technical field. For successfully introducing circularity to the VET system training of the trainers is necessary, also ensuring adequate resources for further training, improvement of the training infrastructure to promote high quality training and the establishment of standardised training programmes and certifications.

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Colophon

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