Integration of Sustainable Design and
Circular Economy Concepts in Civil Engineering Curricula

O1: Defining the Sustainable Design/Circular Economy Principles and Methods to Transform the Contemporary Civil Engineering Curricula

Task 1.2 – Deliverable 1

SUSTAIN-CE skills matrix survey for identifying the skills gap

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TURKISH NATIONAL AGENCY

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Submission Date:	15/06/2021
Leading Partner:	YASAR

Document Revision History

Version	Date	Comment	Author(s)
1.0	**15 June 2021**	**Final Document**	**YASAR**

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Table of Contents

1. Introduction

This document provides an overview of the results of the skills matrix survey. A skills matrix survey was conducted in each three countries to identify the skills gap in terms of employee skills and students' skills related to Sustainable Design (SD)/Circular Economy (CE) concepts. The results of the surveys were used in determining the "List of the specific areas/thematics in the main-curriculum areas for intervention" (Task 1.2_D4); which later formed the bases of the "List of SD/CE themes that will be incorporated to the design courses' contents, for each of the selected thematics".

Four questionnaires were developed to conduct the survey: a) For academicians, b) For industry professionals, c) for Non-Governmental and Governmental Organizations (NGOs / GOs), and d) For students. The total number of responses achieved are listed in Table 1.

Table 1 Number of responses for the questionnaires

	English	Portugal	Greek	Turkis
Academicians	4	4	9	16
Industry Professionals	1	30	5	17
NGOs & GOs	-	8	1	8
Students	9	8	67	44

The questionnaires in English for academicians, industry professionals, NGOs / GOs, and students are presented next, followed by the summary of responses in all four languages.

2. Questionnaires in English

For Academicians:

SUSTAIN-CE project

IO Number: 1

Deliverable name: Questionnaire for the Skill Gap specialization

Deliverable/Task number: 1.2

Training Needs Analysis (Skill Gap) Survey for ACADEMICIANS

Submission Date:	15.06.2021
Leading Partner:	YASAR

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08	15.06.2021	Final	YASAR

Dear Participant,

This questionnaire is part of a European project (SUSTAIN-CE) aiming at developing an innovative, evidence-based transnational framework that will markedly improve the knowledge and skills of academic institutions to produce more innovative curricula on sustainable/circular civil engineering.

In such context, this questionnaire aims to identify the market's (industry) training needs and the available skills in the field of sustainable/circular civil engineering.

Please read each of the following items carefully and mark the answer that best represents your beliefs and experiences (for any doubts, please refer to the glossary - Section F).

Your participation is voluntary, and you are free to withdraw from the study without prior notice at any given time. All the responses and the data you provide will be kept confidential and will be analyzed solely for statistical purposes in the context of the project to develop scientific articles and technical reports.

For any issues related to the project, please contact:

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To proceed with the survey completion, please read the following sentences carefully and mark the relevant boxes as appropriate.

- ☐ I confirm that I have read and understood the terms and conditions for participation in the study.
- ☐ I understand that my participation is voluntary and that I am free to withdraw at any time, without giving reason and with no foreseeable consequence.
- ☐ I agree to take part in the above study.
- ☐ I agree that my data gathered in this study (according to the GDPR principles) may be stored (after it has been anonymised) in a secure storage facility and will be destroyed five years after the study ends.

SECTION A. Respondent's Affiliation

A.1 I am / I belong to (more options allowed)?

- ☐ Civil engineering department
- ☐ Architectural department
- ☐ Other (please specify) _____

A.2 How many faculty members does your Higher Education Institute have?

- ☐ Under 10
- ☐ 11 to 20
- ☐ 21 to 30
- ☐ More than 30

A.3 When was your Higher Education Institute founded?

- ☐ Last 10 years
- ☐ From 10 to 30 years ago
- ☐ More than 30 years ago

A.4 What is your Heigher Educaiton Institute's target market (more options allowed)?

- ☐ Local
- ☐ National
- ☐ European
- ☐ International
- ☐ Other (please specify) _____

SECTION B. Respondent's Information

B.1 What is your gender?

- ☐ Male
- ☐ Female
- ☐ Prefer not to say

B.2 What is your age group?

- ☐ 18 to 25 years
- ☐ 26 to 35 years
- ☐ 36 to 50 years
- ☐ 51 to 65 years
- ☐ Over 65

B.3 What is your current position in the Higher Education Institute?

- ☐ Assistant Professor
- ☐ Associate Professor
- ☐ Professor
- ☐ Post-Doc researcher
- ☐ Other (please specify) _____

B.4 Do you have any practical experience in the field of sustainable/circular civil engineering practices?

- ☐ No, I do not
- ☐ I attended courses at university
- ☐ I attended training sessions
- ☐ I have been involved in related projects
- ☐ I had held some responsibility (technical and/or managerial) for related projects

SECTION C. Drivers and Barriers

The following list shows possible drivers and barriers.

Please, mark every option with a number in the scale range of 1 (minimum) to 5 (maximum) in order to understand how relevant these barriers and drivers are in impeding or implementing sustainable/circular civil engineering practices in your HEI.

C.1 How relevant are the following drivers in pushing the integration of sustainable/circular civil engineering concepts in your curriculum?

☐ Pressures from accreditation institutes	1	2	3	4	5
☐ Governmental/EU regulations and laws	1	2	3	4	5
☐ HEI's green/innovation strategies and improvements	1	2	3	4	5
☐ The role of professional group activities	1	2	3	4	5
☐ Management commitment to environmental improvements	1	2	3	4	5
☐ Global environmental challenges	1	2	3	4	5
☐ Pressures from local society	1	2	3	4	5
☐ Other (please specify and value) _____	1	2	3	4	5

C.2 How relevant are the following barriers in order to actually integrate sustainable/circular civil engineering concepts in your curriculum?

☐ Lack of know-how/intellectual capital	1	2	3	4	5
☐ Lack of technology support	1	2	3	4	5
☐ Weak commitment of top management	1	2	3	4	5
☐ Academic faculty resistance to change	1	2	3	4	5
☐ Not enough pressure from the accredidation institutions	1	2	3	4	5
☐ Time needed to implement such solutions	1	2	3	4	5
☐ Lack of short term benefits	1	2	3	4	5
☐ Other (please specify and value) _____	1	2	3	4	5

SECTION D. Skills

In the following, the identified Areas for Sustainable Design and Circular Economy Concepts in Civil Engineering are broken down into specific skills.

Please, answer each question marking a value in the scale range from 1 (minimum) to 5 (maximum)

SECTION D.1 Sustainable design practices

D.1.1 How familiar are you with the following concepts, in terms of what is particular to each of them?

a) Vernacular architecture	1	2	3	4	5
b) Bioclimatic architecture	1	2	3	4	5
c) Passive house (Passive Haus)	1	2	3	4	5
d) Therma Bridge					
e) Design for sustainability	1	2	3	4	5

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.1.2 To what extent are you familiar with the concept of "***Design for Disassembly***?"

1	2	3	4	5

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.1.3 To what extent are you are familiar with "***Building Reuse***" as a design decision made at the planning stage of a project?

1	2	3	4	5

1=None; 2=Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.1.4 To what extent are you familiar with the fact that sustainable hydraulic structure design considering sediment transport principles is essential to ensure their successful long-term operation.

1	2	3	4	5

1=None; 2=Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.1.5 To what extent are you familiar with the fact that significant sustainability benefits can be derived by integration of sustainable design and circular economy concepts in transportation decision making?

1	2	3	4	5

1=None; 2=Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.1.6 Do you consider sustainable design skills as an important criterion in your faculty member hiring process?

1	2	3	4	5

1=None; 2=Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

SECTION D.2 Circular economy inspired engineering

D.2.1 To what extent are you familiar with circular economy[1]?

1	2	3	4	5

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.2.2 To what extent are you familiar with the following basic principles of circular economy concept?

a)	Design to minimize waste	1	2	3	4	5
b)	Use waste as a resource (recycle, reuse)	1	2	3	4	5
c)	Prioritize regenerative resources	1	2	3	4	5
d)	Preserve and extend what is already made	1	2	3	4	5
e)	Reducing reliance on raw materials by keeping products in use?	1	2	3	4	5

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.2.3 Do you consider circular economy inspired engineering skills as an important criterion in your faculty member hiring process?

1	2	3	4	5

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialize

SECTION D.3 Sustainability of construction materials

D.3.1 To what extent are you aware of what ***Ashby diagrams*** are and what they are used for in research of new materials?

1	2	3	4	5

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.3.2 To what extent are you aware of the fact that recyclability and recycled content are two similar, but different characteristics of materials related to sustainability?

1	2	3	4	5

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.3.3 Are you familiar with the hazardous substances present in building materials that pose a threat to public health and environmental security at the dismantling or demolition phase?

1	2	3	4	5

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.3.4 To what extent are you aware of the fact that reuse is a characteristic of materials related to sustainability?

1	2	3	4	5

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.3.5 To what extent are you familiar with alternative construction materials and wastes that are being used to make them (e.g., geopolymer cement-based concrete, ferro-cement laminated sandwich panels, fly ash, blast-furnace slag)?

1	2	3	4	5

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.3.6 Do you consider skills related to sustainable construction materials as an important criterion in your faculty member hiring process?

1	2	3	4	5

1=None; 2=Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

SECTION D.4 Lifecycle assessment

D.4.1 To what extent are you familiar with life cycle assessment (LCA) procedures and what is quantified by this assessment tool?

1	2	3	4	5

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.4.2 To what extent are you aware of the fact that the material quantities used in the LCA are only half of the necessary data upon which the calculations are to be performed. The other half are the values associated with the inventory of the environmental impacts of the product.

1	2	3	4	5

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.4.3 To what extent are you aware of the following environmental impact categories?

a) Global warming	1	2	3	4	5
b) Primary energy use	1	2	3	4	5
c) Toxicity	1	2	3	4	5
d) Resource depletion	1	2	3	4	5
e) Land use	1	2	3	4	5
f) Water use	1	2	3	4	5

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Special

D.4.4 Do you consider life cycle assessement skills as an important criterion in your faculty member hiring process?

1	2	3	4	5

1=None; 2=Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

SECTION D.5 Smart and sustainable urban design (civil engineering) principles

D.5.1 Are you familiar with the NZEB (Near Aero Energy Buildings) concept brought about by Directive 2010/31/UE on the energy performance of buildings)?

Yes	No

D.5.2 To what extent are you familiar with practices to make buildings more energy efficient?

1		2	3	4	5

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.5.3 Do you consider smart and sustainable urban design principles as an important criterion in your faculty member hiring process?

1	2	3	4	5

1=None; 2=Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

SECTION D.6 Civil engineering policies and regulations on sustainability

D.6.1 To what extent are you aware of the following regulations, standards, declerations, etc.?

a) Environmental product declarations (EPDs[3])	1	2	3	4	5
b) LEED V4[4] rating system	1	2	3	4	5
c) Green building codes (Ex: IgCC[6])	1	2	3	4	5

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Special

D.6.2 To what extent are you familiar with the waste legislation in your country, in particular to what pertains to the licencing procedures for Construction and Demolition Waste (CDW)?

1	2	3	4	5

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D6.3 Do you consider skills related to sustainable civil engineering policies and regulations as an important criterion in your faculty member hiring process?

1	2	3	4	5

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

SECTION E. Knowledge and Skills Improvement

In this section, some questions related to your personal interest in improving your knowledge and skills in the field of sustainable/circular civil engineering are listed.

E.1 Are you used to undertake continuous learning activities in order to increase your knowledge in the areas mentioned in Part D (more options allowed)?

Yes	No

E.2 What kind of methods do you usually adopt?

- ☐ Books

- ☐ Workshops
- ☐ Scientific Papers
- ☐ E-learning
- ☐ Webinars (on-line seminars)
- ☐ Other (please specify) _____

E.3 Would you be interested in the future to undertake training activities to improve your knowledge in these areas (more options allowed)?

- ☐ Energy efficient structures design
- ☐ Sustainable structural design of infrastructure
- ☐ Energy efficient life-cycle analysis
- ☐ Life-cycle analysis that considers sustainability as a main parameter
- ☐ Circular cities
- ☐ Nature based solutions at the urban level
- ☐ Circular design solutions Reversible building design[1] (space, structure and/or material)
- ☐ Waste prevention and management
- ☐ Preventive maintenance
- ☐ Construction and demolition waste management
- ☐ Deconstruction of building structures and parts
- ☐ Any other areas? Please mention which ones: _____

E.4 Why do you think that skills improvement is an important issue?

_____
_____

_____
_____

_____
_____

SECTION F Glossary

[1] **Circular Economy:** A circular economy is a systemic approach to economic development designed to benefit businesses, society, and the environment. In contrast to the 'take-make-waste' linear model, a circular economy is regenerative by design and aims to gradually decouple growth from the consumption of finite resources (Source: https://www.ellenmacarthurfoundation.org/explore/the-circular-economy-in-detail#:~:text=A%20circular%20economy%20is%20a,the%20consumption%20of%20finite%20resources).

[2] **Living Buildings:** Living buildings have fully closed water, nutrition, material, and energy loops. An important element of living buildings is renewable, non-toxic materials that increase reusability/recyclability, and ultimately allow for materials to be safely returned to the biosphere at end of life, thereby acting as 'nutrients' to grow new materials.

[3] **Environmental Product Declaration (EPD):** is a transparent, objective report that communicates what a product is made of and how it impacts the environment across its entire life cycle. EPDs rely on the results of life-cycle assessments to provide information on a number of environmental impacts related to the manufacture of the product, including global warming potential, ozone depletion, acidification, eutrophication, and ozone creation.

[4] **LEED (Leadership in Energy and Environmental Design) v4:** is the most widely green building rating system in the world. Available for virtually all building types, LEED provides a framework for healthy, highly efficient, and cost-saving green buildings. **LEED v4** is the most inclusive and transparen LEE yet, driving meaningful reductions in GHG emissions associated with building construction and operations and putting a stronger emphasis on human health and wellbeing.

f) [5] **American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) 189.1**: ANSI/ASHRAE/ICC/USGBC/IES Standard 189.1-2017 Standard for the Design of High-Performance Green Buildings Except Low-Rise Residential Buildings.

g) [6] International Green Construction Code (IgCC): The 2018 International Green Construction Code (IgCC) provides the design and construction industry with the single, most effective way to deliver sustainable, resilient, high-performance buildings. The 'IgCC-powered-by-189.1' joint initiative frames the essential sustainable construction building blocks on which future resilient initiatives can develop and expand.

Thank you very much for completing this survey!
In case of further questions, please contact:
XXXXXX

For Industry Professionals:

SUSTAIN-CE project

IO Number: 1

Deliverable name: Questionnaire for the Skill Gap specialization

Deliverable/Task number: 1.2

Training Needs Analysis (Skill Gap) Survey for INDUSTRY

Submission Date:	15.06.2021
Leading Partner:	YASAR

Document Revision History

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Dear Participant,

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For any issues related to the project, please contact:

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To proceed with the survey completion, please read the following sentences carefully and mark the relevant boxes as appropriate.

- ☐ I confirm that I have read and understood the terms and conditions for participation in the study.
- ☐ I understand that my participation is voluntary and that I am free to withdraw at any time, without giving reason and with no foreseeable consequence.
- ☐ I agree to take part in the above study.
- ☐ I agree that my data gathered in this study (according to the GDPR principles) may be stored (after it has been anonymised) in a secure storage facility and will be destroyed five years after the study ends.

SECTION A. Respondent's Affiliation

A.1 I am / I belong to (more options allowed)?

- ☐ Civil engineering graduate
- ☐ Architectural graduate
- ☐ Construction company
- ☐ Structural design office
- ☐ Architectural design office
- ☐ Material supplier
- ☐ Other (please specify) _____

A.2 How many employees does your organization have?

- ☐ Under 25
- ☐ 26 to 50
- ☐ 51 to 250
- ☐ More than 250

A.3 When was your company founded?

- ☐ Last 10 years
- ☐ From 10 to 30 years ago
- ☐ More than 30 years ago

A.4 What is your company's target market (more options allowed)?

- ☐ Local
- ☐ National
- ☐ European
- ☐ International
- ☐ Other (please specify) _____

SECTION B. Respondent's Information

B.1 What is your gender?

- ☐ Male
- ☐ Female
- ☐ Prefer not to say

B.2 What is your age group?

- ☐ 18 to 25 years
- ☐ 26 to 35 years
- ☐ 36 to 50 years
- ☐ 51 to 65 years
- ☐ Over 65

B.3 What is your current position in the company?

- ☐ Managerial Staff
- ☐ Technical Staff
- ☐ Administrative Staff
- ☐ Other (please specify) _____

B.4 What is the highest level of qualification you gained?

- ☐ Upper Secondary Education
- ☐ Bachelor's Degree
- ☐ Master's Degree
- ☐ PhD
- ☐ Other (please specify) _____

B.5 Do you have any practical experience in the field of sustainable/circular civil engineering practices?

- ☐ No, I do not
- ☐ I attended courses at university
- ☐ I attended training sessions
- ☐ I have been involved in related projects
- ☐ I had held some responsibility (technical and/or managerial) for related projects

SECTION C. Drivers and Barriers

The following list shows possible drivers and barriers.

Please, mark every option with a number in the scale range of 1 (minimum) to 5 (maximum) in order to understand how relevant these barriers and drivers are in impeding or implementing sustainable/circular civil engineering practices in your company.

C.1 How relevant are the following drivers in pushing the implementation of sustainable/circular civil engineering practices?

☐ Market pressures from local customers	1	2	3	4	5
☐ Market pressures from international customers	1	2	3	4	5
☐ Governmental/EU regulations and laws	1	2	3	4	5
☐ Competitor's green/innovation strategies and improvements	1	2	3	4	5
☐ The role of professional group activities	1	2	3	4	5
☐ Operational cost reduction through energy efficiency	1	2	3	4	5
☐ Corporate social responsibility strategy	1	2	3	4	5
☐ Management commitment to environmental improvements	1	2	3	4	5
☐ Global environmental challenges	1	2	3	4	5
☐ Benefits and savings	1	2	3	4	5
☐ Pressures from local society	1	2	3	4	5
☐ Pressures from investors	1	2	3	4	5
☐ Competitive advantages	1	2	3	4	5
☐ Other (please specify and value) _____	1	2	3	4	5

C.2 How relevant are the following barriers in order to actually integrate sustainable/circular civil engineering practices?

☐ Operational costs	1	2	3	4	5
☐ Training costs	1	2	3	4	5
☐ Costs of improvement implementations	1	2	3	4	5
☐ Lack of know-how/intellectual capital	1	2	3	4	5
☐ Lack of technology support	1	2	3	4	5
☐ Weak commitment of top management	1	2	3	4	5
☐ Employee resistance to change	1	2	3	4	5
☐ Lack of suppliers commitment	1	2	3	4	5
☐ Not enough pressure from the market	1	2	3	4	5
☐ Time needed to implement such solutions	1	2	3	4	5
☐ Lack of short term benefits	1	2	3	4	5
☐ Other (please specify and value) _____	1	2	3	4	5

SECTION D. Skills

In the following, the identified Areas for Sustainable Design and Circular Economy Concepts in Civil Engineering are broken down into specific skills.

Please, answer each question marking a value in the scale range from 1 (minimum) to 5 (maximum)

SECTION D.1 Sustainable design practices

D.1.1 How familiar are you with the following concepts, in terms of what is particular to each of them?

f) Vernacular architecture	1	2	3	4	5
g) Bioclimatic architecture	1	2	3	4	5
h) Passive house (Passive Haus)	1	2	3	4	5
i) Therma Bridge					
j) Design for sustainability	1	2	3	4	5

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.1.2 To what extent are you familiar with the concept of "***Design for Disassembly***?"

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.1.3 To what extent are you are familiar with "***Building Reuse***" as a design decision made at the planning stage of a project?

1=None; 2=Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.1.4 To what extent are you familiar with the fact that sustainable hydraulic structure design considering sediment transport principles is essential to ensure their successful long-term operation.

1=None; 2=Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.1.5 To what extent are you familiar with the fact that significant sustainability benefits can be derived by integration of sustainable design and circular economy concepts in transportation decision making?

1=None; 2=Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.1.6 Do you consider sustainable design skills as an important criterion in your civil engineer/architect hiring process?

1=None; 2=Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

SECTION D.2 Circular economy inspired engineering

D.2.1 To what extent are you familiar with circular economy[1]?

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.2.2 To what extent are you familiar with the following basic principles of circular economy concept?

h)	Design to minimize waste	1	2	3	4	5
i)	Use waste as a resource (recycle, reuse)	1	2	3	4	5
j)	Prioritize regenerative resources	1	2	3	4	5
k)	Preserve and extend what is already made	1	2	3	4	5
l)	Reducing reliance on raw materials by keeping products in use?	1	2	3	4	5

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.2.3 Do you consider circular economy inspired engineering skills as an important criterion in your civil engineer/architect hiring process?

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialize

SECTION D.3 Sustainability of construction materials

D.3.1 To what extent are you aware of what ***Ashby diagrams*** are and what they are used for in research of new materials?

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.3.2 To what extent are you aware of the fact that recyclability and recycled content are two similar, but different characteristics of materials related to sustainability?

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.3.3 Are you familiar with the hazardous substances present in building materials that pose a threat to public health and environmental security at the dismantling or demolition phase?

1	2	3	4	5

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.3.4 To what extent are you aware of the fact that reuse is a characteristic of materials related to sustainability?

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.3.5 To what extent are you familiar with alternative construction materials and wastes that are being used to make them (e.g., geopolymer cement-based concrete, ferro-cement laminated sandwich panels, fly ash, blast-furnace slag)?

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.3.6 Do you consider skills related to sustainable construction materials as important criterion in your civil engineer/architect hiring process?

1	2	3	4	5

1=None; 2=Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

SECTION D.4 Lifecycle assessment

D.4.1 To what extent are you familiar with life cycle assessment (LCA) procedures and what is quantified by this assessment tool?

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.4.2 To what extent are you aware of the fact that the material quantities used in the LCA are only half of the necessary data upon which the calculations are to be performed. The other half are the values associated with the inventory of the environmental impacts of the product.

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.4.3 To what extent are you aware of the following environmental impact categories?

g)	Global warming	1	2	3	4	5
h)	Primary energy use	1	2	3	4	5
i)	Toxicity	1	2	3	4	5
j)	Resource depletion	1	2	3	4	5
k)	Land use	1	2	3	4	5
l)	Water use	1	2	3	4	5

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Special

D.4.4 Do you consider life cycle assessment skills as an important criterion in your civil engineer/architect hiring process?

1=None; 2=Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

SECTION D.5 Smart and sustainable urban design (civil engineering) principles

D.5.1 Are you familiar with the NZEB (Near Aero Energy Buildings) concept brought about by Directive 2010/31/UE on the energy performance of buildings)?

Yes	No

D.5.2 To what extent are you familiar with practices to make buildings more energy efficient?

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.5.3 Do you consider smart and sustainable urban design principles as an important criterion in your civil engineer/architect hiring process?

1=None; 2=Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

SECTION D.6 Civil engineering policies and regulations on sustainability

D.6.1 To what extent are you aware of the following regulations, standards, declerations, etc.?

d)	Environmental product declarations (EPDs[3])	1	2	3	4	5
e)	LEED V4[4] rating system	1	2	3	4	5
f)	Green building codes (Ex: IgCC[6])	1	2	3	4	5

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Special

D.6.2 To what extent are you familiar with the waste legislation in your country, in particular to what pertains to the licencing procedures for Construction and Demolition Waste (CDW)?

1	2	3	4	5

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D6.3 Do you consider skills related to sustainable civil engineering policies and regulations as an important criterion in your civil engineer/architect hiring process?

1	2	3	4	5

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

SECTION E. Knowledge and Skills Improvement

In this section, some questions related to your personal interest in improving your knowledge and skills in the field of sustainable/circular civil engineering are listed.

E.1 Are you used to undertake continuous learning activities in order to increase your knowledge in the areas mentioned in Part D (more options allowed)?

Yes	No

E.2 What kind of methods do you usually adopt?

- ☐ Books
- ☐ Workshops
- ☐ Scientific Papers
- ☐ E-learning
- ☐ Webinars (on-line seminars)
- ☐ Other (please specify) _____

E.3 Would you be interested in the future to undertake training activities to improve your knowledge in these areas (more options allowed)?

- ☐ Energy efficient structures design
- ☐ Sustainable structural design of infrastructure
- ☐ Energy efficient life-cycle analysis
- ☐ Life-cycle analysis that considers sustainability as a main parameter
- ☐ Circular cities
- ☐ Nature based solutions at the urban level
- ☐ Circular design solutions Reversible building design[1] (space, structure and/or material)
- ☐ Waste prevention and management
- ☐ Preventive maintenance
- ☐ Construction and demolition waste management
- ☐ Deconstruction of building structures and parts
- ☐ Any other areas? Please mention which ones: _____

E.4 Why do you think that skills improvement is an important issue?

_____

_____

_____

SECTION F Glossary

[1] **Circular Economy:** A circular economy is a systemic approach to economic development designed to benefit businesses, society, and the environment. In contrast to the 'take-make-waste' linear model, a circular economy is regenerative by design and aims to gradually decouple growth from the consumption of finite resources (Source: https://www.ellenmacarthurfoundation.org/explore/the-circular-economy-in-etail#:~:text=A%20circular%20economy%20is%20a,the%20consumption%20of%20finite%20resources).

[2] **Living Buildings:** Living buildings have fully closed water, nutrition, material, and energy loops. An important element of living buildings is renewable, non-toxic materials that increase reusability/recyclability, and ultimately allow for materials to be safely returned to the biosphere at end of life, thereby acting as 'nutrients' to grow new materials.

[3] **Environmental Product Declaration (EPD):** is a transparent, objective report that communicates what a product is made of and how it impacts the environment across its entire life cycle. EPDs rely on the results of life-cycle assessments to provide information on a number of environmental impacts related to the manufacture of the product, including global warming potential, ozone depletion, acidification, eutrophication, and ozone creation.

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m) [5] **American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) 189.1**: ANSI/ASHRAE/ICC/USGBC/IES Standard 189.1-2017 Standard for the Design of High-Performance Green Buildings Except Low-Rise Residential Buildings.

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Thank you very much for completing this survey!
In case of further questions, please contact:
XXXXXX

Questionnaire for NGOs / GOs:

o) SUSTAIN-CE project

p) IO Number: 1

q) Deliverable name: Questionnaire for the Skill Gap specialization

r) Deliverable/Task number: 1.2

s) Training Needs Analysis (Skill Gap) Survey for ASSOCIATIONS/GOVERNMENT ORGANIZATIONS/NON-GOVERMENTAL ORGANIZATIONS

Submission Date:	15.06.2021
Leading Partner:	YASAR

Document Revision History

Version	Date	Comment	Author(s)
01	23.01.2021	First draft/structure	SEERC
02	22.3.2021	Draft	IYTE
03	16.04.2021	Draft	YU
04	20.04.2021	Draft	YU
05	25.04.2021	Draft	SEERC
06	29.04.2021	Draft	YU
07	10.06.2021	Draft	ISQ
08	15.06.2021	Final	YASAR

Dear Participant,

This questionnaire is part of a European project (SUSTAIN-CE) aiming at developing an innovative, evidence-based transnational framework that will markedly improve the knowledge and skills of academic institutions to produce more innovative curricula on sustainable/circular civil engineering.

In such context, this questionnaire aims to identify the market's (industry) training needs and the available skills in the field of sustainable/circular civil engineering.

Please read each of the following items carefully and mark the answer that best represents your beliefs and experiences (for any doubts, please refer to the glossary - Section F).

Your participation is voluntary, and you are free to withdraw from the study without prior notice at any given time. All the responses and the data you provide will be kept confidential and will be analyzed solely for statistical purposes in the context of the project to develop scientific articles and technical reports.

For any issues related to the project, please contact:

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To proceed with the survey completion, please read the following sentences carefully and mark the relevant boxes as appropriate.

- ☐ I confirm that I have read and understood the terms and conditions for participation in the study.
- ☐ I understand that my participation is voluntary and that I am free to withdraw at any time, without giving reason and with no foreseeable consequence.
- ☐ I agree to take part in the above study.
- ☐ I agree that my data gathered in this study (according to the GDPR principles) may be stored (after it has been anonymised) in a secure storage facility and will be destroyed five years after the study ends.

SECTION A. Respondent's Affiliation

A.1 I am / I belong to (more options allowed)?

- ☐ Civil engineering graduate
- ☐ Architectural graduate
- ☐ Representative of civil engineers and architects assoiations
- ☐ Representative of environmental associations
- ☐ Government
- ☐ NGO
- ☐ Other (please specify) _____

A.2 How many employees does your organization have?

- ☐ Under 25
- ☐ 26 to 50
- ☐ 51 to 250
- ☐ More than 250

A.3 When was your association/GO/NGO founded?

- ☐ Last 10 years
- ☐ From 10 to 30 years ago
- ☐ More than 30 years ago

A.4 What is your association/GO/NGO's target market (more options allowed)?

- ☐ Local
- ☐ National
- ☐ European
- ☐ International
- ☐ Other (please specify) _____

SECTION B. Respondent's Information

B.1 What is your gender?

- ☐ Male
- ☐ Female
- ☐ Prefer not to say

B.2 What is your age group?

- ☐ 18 to 25 years
- ☐ 26 to 35 years
- ☐ 36 to 50 years
- ☐ 51 to 65 years
- ☐ Over 65

B.3 What is your current position in the association/GO/NGO?

- ☐ Managerial Staff
- ☐ Technical Staff
- ☐ Administrative Staff
- ☐ Other (please specify) _____

B.4 What is the highest level of qualification you gained?

- ☐ Upper Secondary Education
- ☐ Bachelor's Degree
- ☐ Master's Degree
- ☐ PhD
- ☐ Other (please specify) _____

B.5 Do you have any practical experience in the field of sustainable/circular civil engineering practices?

- ☐ No, I do not
- ☐ I attended courses at university
- ☐ I attended training sessions
- ☐ I have been involved in related projects
- ☐ I had held some responsibility (technical and/or managerial) for related projects

SECTION C. Drivers and Barriers

The following list shows possible drivers and barriers.

Please, mark every option with a number in the scale range of 1 (minimum) to 5 (maximum) in order to understand how relevant these barriers and drivers are in impeding or implementing sustainable/circular civil engineering practices in your association/GO/NGO.

C.1 How relevant are the following drivers in pushing the implementation of sustainable/circular civil engineering practices?

☐	Market pressures from local associates	1	2	3	4	5
☐	Market pressures from international associates	1	2	3	4	5
☐	Governmental/EU regulations and laws	1	2	3	4	5
☐	Other organization's green/innovation strategies and improvements	1	2	3	4	5
☐	The role of professional group activities	1	2	3	4	5
☐	Operational cost reduction through energy efficiency	1	2	3	4	5
☐	Management commitment to environmental improvements	1	2	3	4	5
☐	Global environmental challenges	1	2	3	4	5
☐	Benefits and savings	1	2	3	4	5
☐	Pressures from local society	1	2	3	4	5
☐	Other (please specify and value) _____	1	2	3	4	5

C.2 How relevant are the following barriers in order to actually integrate sustainable/circular civil engineering sustainable/circular civil engineering practices?

☐	Operational costs	1	2	3	4	5
☐	Training costs	1	2	3	4	5
☐	Costs of improvement implementations	1	2	3	4	5
☐	Lack of know-how/intellectual capital	1	2	3	4	5
☐	Lack of technology support	1	2	3	4	5
☐	Weak commitment of top management	1	2	3	4	5
☐	Employee resistance to change	1	2	3	4	5
☐	Not enough pressure from the market	1	2	3	4	5
☐	Time needed to implement such solutions	1	2	3	4	5
☐	Lack of short term benefits	1	2	3	4	5
☐	Other (please specify and value) _____	1	2	3	4	5

SECTION D. Skills

In the following, the identified Areas for Sustainable Design and Circular Economy Concepts in Civil Engineering are broken down into specific skills.

Please, answer each question marking a value in the scale range from 1 (minimum) to 5 (maximum)

SECTION D.1 Sustainable design practices

D.1.1 How familiar are you with the following concepts, in terms of what is particular to each of them?

k) Vernacular architecture	1	2	3	4	5
l) Bioclimatic architecture	1	2	3	4	5
m) Passive house (Passive Haus)	1	2	3	4	5
n) Therma Bridge					
o) Design for sustainability	1	2	3	4	5

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.1.2 To what extent are you familiar with the concept of "***Design for Disassembly***?"

1	2	3	4	5

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.1.3 To what extent are you are familiar with "***Building Reuse***" as a design decision made at the planning stage of a project?

1	2	3	4	5

1=None; 2=Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.1.4 To what extent are you familiar with the fact that sustainable hydraulic structure design considering sediment transport principles is essential to ensure their successful long-term operation.

1	2	3	4	5

1=None; 2=Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.1.5 To what extent are you familiar with the fact that significant sustainability benefits can be derived by integration of sustainable design and circular economy concepts in transportation decision making?

1	2	3	4	5

1=None; 2=Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.1.6 Do you consider sustainable design skills as an important criterion in your civil engineer/architect hiring process?

1	2	3	4	5

1=None; 2=Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

SECTION D.2 Circular economy inspired engineering

D.2.1 To what extent are you familiar with circular economy[1]?

1	2	3	4	5

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.2.2 To what extent are you familiar with the following basic principles of circular economy concept?

t)	Design to minimize waste	1	2	3	4	5
u)	Use waste as a resource (recycle, reuse)	1	2	3	4	5
v)	Prioritize regenerative resources	1	2	3	4	5
w)	Preserve and extend what is already made	1	2	3	4	5
x)	Reducing reliance on raw materials by keeping products in use?	1	2	3	4	5

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.2.3 Do you consider circular economy inspired engineering skills as an important criterion in your civil engineer/architect hiring process?

1	2	3	4	5

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialize

SECTION D.3 Sustainability of construction materials

D.3.1 To what extent are you aware of what ***Ashby diagrams*** are and what they are used for in research of new materials?

1	2	3	4	5

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.3.2 To what extent are you aware of the fact that recyclability and recycled content are two similar, but different characteristics of materials related to sustainability?

1	2	3	4	5

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.3.3 Are you familiar with the hazardous substances present in building materials that pose a threat to public health and environmental security at the dismantling or demolition phase?

1	2	3	4	5

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.3.4 To what extent are you aware of the fact that reuse is a characteristic of materials related to sustainability?

1	2	3	4	5

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.3.5 To what extent are you familiar with alternative construction materials and wastes that are being used to make them (e.g., geopolymer cement-based concrete, ferro-cement laminated sandwich panels, fly ash, blast-furnace slag)?

1	2	3	4	5

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.3.6 Do you consider skills related to sustainable construction materials as an important asset in your civil engineer/architect hiring process??

1	2	3	4	5

1=None; 2=Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

SECTION D.4 Lifecycle assessment

D.4.1 To what extent are you familiar with life cycle assessment (LCA) procedures and what is quantified by this assessment tool?

1	2	3	4	5

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.4.2 To what extent are you aware of the fact that the material quantities used in the LCA are only half of the necessary data upon which the calculations are to be performed. The other half are the values associated with the inventory of the environmental impacts of the product.

1	2	3	4	5

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.4.3 To what extent are you aware of the following environmental impact categories?

m) Global warming	1	2	3	4	5
n) Primary energy use	1	2	3	4	5
o) Toxicity	1	2	3	4	5
p) Resource depletion	1	2	3	4	5
q) Land use	1	2	3	4	5
r) Water use	1	2	3	4	5

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Special

D.4.4 Do you consider life cycle assessement skills as an important criterion in your civil engineer/architect hiring process?

1	2	3	4	5

1=None; 2=Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

SECTION D.5 Smart and sustainable urban design (civil engineering) principles

D.5.1 Are you familiar with the NZEB (Near Aero Energy Buildings) concept brought about by Directive 2010/31/UE on the energy performance of buildings)?

Yes	No

D.5.2 To what extent are you familiar with practices to make buildings more energy efficient?

1		2	3	4	5

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.5.3 Do you consider smart and sustainable urban design principles as an important criterion in your civil engineer/architect hiring process?

1	2	3	4	5

1=None; 2=Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

SECTION D.6 Civil engineering policies and regulations on sustainability

D.6.1 To what extent are you aware of the following regulations, standards, declerations, etc.?

g) Environmental product declarations (EPDs[3])	1	2	3	4	5
h) LEED V4[4] rating system	1	2	3	4	5
i) Green building codes (Ex: IgCC[6])	1	2	3	4	5

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Special

D.6.2 To what extent are you familiar with the waste legislation in your country, in particular to what pertains to the licencing procedures for Construction and Demolition Waste (CDW)?

1	2	3	4	5

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D6.3 Do you consider skills related to sustainable civil engineering policies and regulations as an important criterion in your civil engineer/architect hiring process?

1	2	3	4	5

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SECTION E. Knowledge and Skills Improvement

In this section, some questions related to your personal interest in improving your knowledge and skills in the field of sustainable/circular civil engineering are listed.

E.1 Are you used to undertake continuous learning activities in order to increase your knowledge in the areas mentioned in Part D (more options allowed)?

Yes	No

E.2 What kind of methods do you usually adopt?

- ☐ Books
- ☐ Workshops

- ☐ Scientific Papers
- ☐ E-learning
- ☐ Webinars (on-line seminars)
- ☐ Other (please specify) _____

E.3 Would you be interested in the future to undertake training activities to improve your knowledge in these areas (more options allowed)?

- ☐ Energy efficient structures design
- ☐ Sustainable structural design of infrastructure
- ☐ Energy efficient life-cycle analysis
- ☐ Life-cycle analysis that considers sustainability as a main parameter
- ☐ Circular cities
- ☐ Nature based solutions at the urban level
- ☐ Circular design solutions Reversible building design[1] (space, structure and/or material)
- ☐ Waste prevention and management
- ☐ Preventive maintenance
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- ☐ Deconstruction of building structures and parts
- ☐ Any other areas? Please mention which ones: _____

E.4 Why do you think that skills improvement is an important issue?

_____
_____

_____
_____

_____
_____

SECTION F Glossary

[1] **Circular Economy:** A circular economy is a systemic approach to economic development designed to benefit businesses, society, and the environment. In contrast to the 'take-make-waste' linear model, a circular economy is regenerative by design and aims to gradually decouple growth from the consumption of finite resources (Source: https://www.ellenmacarthurfoundation.org/explore/the-circular-economy-in-etail#:~:text=A%20circular%20economy%20is%20a,the%20consumption%20of%20finite%20resources).

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XXXXXX

Questionnaire Students:

aa) SUSTAIN-CE project

bb) IO Number: 1

cc) Deliverable name: Questionnaire for the Skill Gap specialization

dd) Deliverable/Task number: 1.2

ee) Training Needs Analysis (Skill Gap) Survey for STUDENTS

Submission Date:	15.06.2021
Leading Partner:	YASAR

Document Revision History

Version	Date	Comment	Author(s)
01	23.01.2021	First draft/structure	SEERC
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For any issues related to the project, please contact:

- Dr. Oguz Ozgur Egilmez (Turkey)
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- Lara Olívia P. Ramos –(Portugal)
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  Email: loramos@isq.pt
  Phone: +351 214 228 100

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SECTION A. Respondent's Affiliation

A.1 I am / I belong to (more options allowed)?

- ☐ Civil engineering student
- ☐ Architectural student
- ☐ Other (please specify) _____

A.2 How many students does your department have?

- ☐ Under 200
- ☐ 201 to 400
- ☐ 401 to 600
- ☐ More than 600

A.3 When was your Higher Education Institute founded?

- ☐ Last 10 years
- ☐ From 10 to 30 years ago
- ☐ More than 30 years ago

A.4 What is your Heigher Educaiton Institute's target market (more options allowed)?

- ☐ Local
- ☐ National
- ☐ European
- ☐ International
- ☐ Other (please specify) _____

SECTION B. Respondent's Information

B.1 What is your gender?

- ☐ Male
- ☐ Female
- ☐ Prefer not to say

B.2 What is your age group?

- ☐ 18 to 25 years
- ☐ 26 to 35 years
- ☐ 36 to 50 years
- ☐ 51 to 65 years
- ☐ Over 65

B.3 What is the degree you are pursuing?

- ☐ Bachelor's Degree
- ☐ Master's Degree
- ☐ PhD Degree
- ☐ Other (please specify) _____

B.4 Do you have any practical experience in the field of sustainable/circular civil engineering practices?

- ☐ No, I do not
- ☐ I attended courses at university
- ☐ I attended training sessions
- ☐ I have been involved in related projects
- ☐ I had held some responsibility (technical and/or managerial) for related projects

SECTION C. Drivers and Barriers

SECTION C IS INTENSIONALLY LEFT BLANK

SECTION D. Skills

In the following, the identified Areas for Sustainable Design and Circular Economy Concepts in Civil Engineering are broken down into specific skills.

Please, answer each question marking a value in the scale range from 1 (minimum) to 5 (maximum)

SECTION D.1 Sustainable design practices

D.1.1 How familiar are you with the following concepts, in terms of what is particular to each of them?

p) Vernacular architecture	1	2	3	4	5
q) Bioclimatic architecture	1	2	3	4	5
r) Passive house (Passive Haus)	1	2	3	4	5
s) Therma Bridge					
t) Design for sustainability	1	2	3	4	5

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.1.2 To what extent are you familiar with the concept of "***Design for Disassembly***?"

1	2	3	4	5

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.1.3 To what extent are you are familiar with "***Building Reuse***" as a design decision made at the planning stage of a project?

1	2	3	4	5

1=None; 2=Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.1.4 To what extent are you familiar with the fact that sustainable hydraulic structure design considering sediment transport principles is essential to ensure their successful long-term operation?

1	2	3	4	5

1=None; 2=Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.1.5 To what extent are you familiar with the fact that significant sustainability benefits can be derived by integration of sustainable design and circular economy concepts in transportation decision making?

1	2	3	4	5

1=None; 2=Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.1.5 Do you consider sustainable design skills as an important asset in your employment search process?

1	2	3	4	5

1=None; 2=Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

SECTION D.2 Circular economy inspired engineering

D.2.1 To what extent are you familiar with circular economy[1]?

1	2	3	4	5

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.2.2 To what extent are you familiar with the following basic principles of circular economy concept?

ff) Design to minimize waste	1	2	3	4	5
gg) Use waste as a resource (recycle, reuse)	1	2	3	4	5
hh) Prioritize regenerative resources	1	2	3	4	5
ii) Preserve and extend what is already made	1	2	3	4	5
jj) Reducing reliance on raw materials by keeping products in use?	1	2	3	4	5

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.2.3 Do you consider circular economy inspired engineering skills as an important asset in your employment search process?

1	2	3	4	5

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialize

SECTION D.3 Sustainability of construction materials

D.3.1 To what extent are you aware of what ***Ashby diagrams*** are and what they are used for in research of new materials?

1	2	3	4	5

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.3.2 To what extent are you aware of the fact that recyclability and recycled content are two similar, but different characteristics of materials related to sustainability?

1	2	3	4	5

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.3.3 Are you familiar with the hazardous substances present in building materials that pose a threat to public health and environmental security at the dismantling or demolition phase?

1	2	3	4	5

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.3.4 To what extent are you aware of the fact that reuse is a characteristic of materials related to sustainability?

1	2	3	4	5

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.3.5 To what extent are you familiar with alternative construction materials and wastes that are being used to make them (e.g., geopolymer cement-based concrete, ferro-cement laminated sandwich panels, fly ash, blast-furnace slag)?

1	2	3	4	5

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.3.6 Do you consider skills related to sustainable construction materials as an important asset in your employment search process?

1	2	3	4	5

1=None; 2=Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

SECTION D.4 Lifecycle assessment

D.4.1 To what extent are you familiar with life cycle assessment (LCA) procedures and what is quantified by this assessment tool?

1	2	3	4	5

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.4.2 To what extent are you aware of the fact that the material quantities used in the LCA are only half of the necessary data upon which the calculations are to be performed. The other half are the values associated with the inventory of the environmental impacts of the product.

1	2	3	4	5

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.4.3 To what extent are you aware of the following environmental impact categories?

s) Global warming	1	2	3	4	5
t) Primary energy use	1	2	3	4	5
u) Toxicity	1	2	3	4	5
v) Resource depletion	1	2	3	4	5
w) Land use	1	2	3	4	5
x) Water use	1	2	3	4	5

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Special

D.4.4 Do you consider life cycle assessment skills as an important asset in your employment search process?

1	2	3	4	5

1=None; 2=Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

SECTION D.5 Smart and sustainable urban design (civil engineering) principles

D.5.1 Are you familiar with the NZEB (Near Aero Energy Buildings) concept brought about by Directive 2010/31/UE on the energy performance of buildings)?

Yes	No

D.5.2 To what extent are you familiar with practices to make buildings more energy efficient?

1		2	3	4	5

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D.5.3 Do you consider smart and sustainable urban design principles as an important asset in your employment search process?

1	2	3	4	5

1=None; 2=Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

SECTION D.6 Civil engineering policies and regulations on sustainability

D.6.1 To what extent are you aware of the following regulations, standards, declerations, etc.?

j)	Environmental product declarations (EPDs[3])	1	2	3	4	5
k)	LEED V4[4] rating system	1	2	3	4	5
l)	Green building codes (Ex: IgCC[6])	1	2	3	4	5

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Special

D.6.2 To what extent are you familiar with the waste legislation in your country, in particular to what pertains to the licencing procedures for Construction and Demolition Waste (CDW)?

1	2	3	4	5

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

D6.3 Do you consider skills related to sustainable civil engineering policies and regulations as an important asset in your employment search process?

1	2	3	4	5

1=None; 2= Basic; 3=Intermediate; 4=Advanced; 5=Highly Specialized

SECTION E. Knowledge and Skills Improvement

In this section, some questions related to your personal interest in improving your knowledge and skills in the field of sustainable/circular civil engineering are listed.

E.1 Are you used to undertake continuous learning activities in order to increase your knowledge in the areas mentioned in Part D (more options allowed)?

Yes	No

E.2 What kind of methods do you usually adopt?

- ☐ Books
- ☐ Workshops

- ☐ Scientific Papers
- ☐ E-learning
- ☐ Webinars (on-line seminars)
- ☐ Other (please specify) _____

E.3 Would you be interested in the future to undertake training activities to improve your knowledge in these areas (more options allowed)?

- ☐ Energy efficient structures design
- ☐ Sustainable structural design of infrastructure
- ☐ Energy efficient life-cycle analysis
- ☐ Life-cycle analysis that considers sustainability as a main parameter
- ☐ Circular cities
- ☐ Nature based solutions at the urban level
- ☐ Circular design solutions Reversible building design[1] (space, structure and/or material)
- ☐ Waste prevention and management
- ☐ Preventive maintenance
- ☐ Construction and demolition waste management
- ☐ Deconstruction of building structures and parts
- ☐ Any other areas? Please mention which ones: _____

E.4 Why do you think that skills improvement is an important issue?

_____
_____

_____
_____

_____
_____

SECTION F Glossary

[1] **Circular Economy:** A circular economy is a systemic approach to economic development designed to benefit businesses, society, and the environment. In contrast to the 'take-make-waste' linear model, a circular economy is regenerative by design and aims to gradually decouple growth from the consumption of finite resources (Source: https://www.ellenmacarthurfoundation.org/explore/the-circular-economy-in-etail#:~:text=A%20circular%20economy%20is%20a,the%20consumption%20of%20finite%20resources).

[2] **Living Buildings:** Living buildings have fully closed water, nutrition, material, and energy loops. An important element of living buildings is renewable, non-toxic materials that increase reusability/recyclability, and ultimately allow for materials to be safely returned to the biosphere at end of life, thereby acting as 'nutrients' to grow new materials.

[3] **Environmental Product Declaration (EPD):** is a transparent, objective report that communicates what a product is made of and how it impacts the environment across its entire life cycle. EPDs rely on the results of life-cycle assessments to provide information on a number of environmental impacts related to the manufacture of the product, including global warming potential, ozone depletion, acidification, eutrophication, and ozone creation.

[4] **LEED (Leadership in Energy and Environmental Design) v4:** is the most widely green building rating system in the world. Available for virtually all building types, LEED provides a framework for healthy, highly efficient, and cost-saving green buildings. **LEED v4** is the most inclusive and transparen LEE yet, driving meaningful reductions in GHG emissions associated with building construction and operations and putting a stronger emphasis on human health and wellbeing.

kk) [5] **American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) 189.1**: ANSI/ASHRAE/ICC/USGBC/IES Standard 189.1-2017 Standard for the Design of High-Performance Green Buildings Except Low-Rise Residential Buildings.

ll) [6] International Green Construction Code (IgCC): The 2018 International Green Construction Code (IgCC) provides the design and construction industry with the single, most effective way to deliver sustainable, resilient, high-performance buildings. The 'IgCC-powered-by-189.1' joint initiative frames the essential sustainable construction building blocks on which future resilient initiatives can develop and expand.

Thank you very much for completing this survey!
In case of further questions, please contact:
XXXXXX

3. Questionnaire Results