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SUSTAIN – CE

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

3rd Biannual Evaluation Report

March – October 2022

PRODUCED BY ISQ



Erasmus+



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1 INTRODUCTION

SUSTAIN-CE addresses circular economy concepts and principles within the construction sector, aiming at integrating principles of sustainable development and circular economy (SD/CE) in civil engineering curricula, which should consider all steps from raw material to the life cycle of the end-product in the construction sector.

Infrastructure is the backbone of sustainable development and forms much of the foundation for quality of life. However, it consumes vast material resources and energy. For this reason, it is of paramount importance that prospective engineers, who will design, construct, and maintain these systems for the next 50 or more years, are equipped with the awareness and knowledge of sustainable infrastructure design.

Civil engineering covers a wide range of disciplines that incorporates infrastructures: construction, environmental, geotechnical, water resources, structural and transportation engineering. Therefore, it is imperative civil engineering undergraduate students get accustomed to concepts and principles needed to meet the requirements of sustainability in civil engineering projects. As a response, SUSTAIN-CE project will attempt to enrich the contemporary civil engineering undergraduate programs' curricula, which are mainly focused on regulations, standards, codes and safety and serviceability of infrastructure systems, by incorporating sustainability, resilience and circular economy concepts in various stages of the design courses.

SUSTAIN CE will result in the co-creation of a new innovative undergraduate civil engineering curriculum that covers sustainable infrastructure design to ensure graduates can apply concepts and principles of sustainable design (SD) and circular economy (CE) in the design and construction of civil engineering projects.

In short, SUSTAIN-CE will result in the following deliverables:

- 1) The syllabus and contents of a new course supporting the SD/CE concepts in civil engineering
- 2) Three Training Events – Training Academies - implemented in Portugal, Greece, and Turkey.
- 3) Three evaluation reports summarizing the results of the three Training Academies
- 4) A guideline for other educational institutions willing to implement SUSTAIN-CE Training Academies.
- 5) One VLE platform (design, develop and content)

PARTNERSHIP

SUSTAIN project is being conducted by a consortium of six partners from three European countries: Turkey, Greece and Portugal. Comprised of three universities, one research centre, one construction company and one partner with extensive experience in curriculum design and circular economy, SUSTAIN consortium covers the expertise needed to successfully implement the project goals. Table 1 presents all six partners.

Table 1

PARTNER	Acronym	COUNTRY
YASAR UNIVERSITESI COORDINATOR	YU	Turkey
IZMIR INSTITUTE OF TECHNOLOGY	IYTE	Turkey
ARISTOTLE UNIVERSITY OF THESSALONIKI (ARISTOTELIO PANEPISTIMIO THESSALONIKIS)	AUTh	Greece
SOUTH-EAST EUROPEAN RESEARCH CENTRE (KENTRO EREVNON NOTIOANATOLIKIS EVROPIS ASTIKI MI KERDOSKOPIKI ETAIREIA)	SEERC	Greece
INSTITUTE FOR TECHNOLOGY AND QUALITY (INSTITUTO DE SOLDADURA E QUALIDADE)	ISQ	Portugal
FOLKART YAPI SANAYI TICARET A.S.	FOLKART	Turkey



2 QUALITY EVALUATION AND MONITORING STRATEGY

SUSTAIN CE consortium has developed a Quality and Evaluation Handbook aiming at ascertaining the methodology and tools that will be used to evaluate and monitor the quality of the project and its deliverables.

Focusing on the 3P model¹ developed by ISQ, the Quality and Evaluation Handbook was designed to support the project management and to guide all partners on evaluation and quality issues. As such, besides the definition of the evaluation methodology, rooted in the 3P model and in specific questionnaires designed for the evaluation of (a) meetings, (b) training activities and (c) multiplier events, the Quality and Evaluation Handbook includes a set of **performance indicators** (see table 4 of the Quality and Evaluation Handbook), agreed upon by all partners, aiming at providing a quantitative measure of the project quality and performance and, hence, the possibility to act upon any less positive result in due time.

In terms of quality evaluation and monitoring, major milestones are the *interim* and *final* reports, delivered in the middle (month 16) and the end (month 32) of the project lifecycle. These will be the most important quality evaluation and monitoring documents, comprising a combined analysis of all the quality data collected up to the time the report is released, including results from the 3P questionnaire. The main goal of the interim report is to demonstrate the strengths and the issues that need to be addressed in the project, as well as identify possible risks and mitigation actions. The Final report then evaluates whereas whatever was hindering the project best results was overcome, as well as main results achieved by the consortium.

In-between these, quality evaluation will be made every 6 to 7 months in the form of biannual quality reports which aim at gathering all quality results collected by the quality evaluation tools applied in that period. These comprise quality evaluation questionnaires specifically designed for (1) *meetings*, (2) *learning activities* and (3) *multiplier events*.

This is the fourth of those biannual quality reports and pertains to the period March to October 2022.

MEETINGS

Meetings are a fundamental component of project management and development: they are a valuable opportunity for discussion and decision-making. And for that reason, aspects pertaining to the preparation of the meeting by the coordinator, how prepared each partner attends the meeting and presents their point of view and work progress to date, and the overall attitude of a given partner during the meeting, do have considerable impact on the way work progress and quality go.

For quality evaluation purposes, two types of meetings are considered: Transnational Project Meetings (TPMs) and Follow-Up meetings (FUMs). TPMs are project meetings foreseen by the proposal and hence destined for specific decision-making moments, according to the project status when the meeting takes place.

Follow-up meetings are online meetings scheduled as and when the consortium feels the need to discuss and decide on a given subject.

In the case of the SUSTAIN-CE project, it was decided not to evaluate follow-up meetings given the fact that a considerable number of them were attended by the members of a specific working group and, hence, it would not be possible to compare meetings held by different groups of partners and hence to draw reliable conclusions from evaluating individual FUMs. So, for the case of SUSTAIN project, only TPMs were evaluated at the end of each meeting.

¹ 3P stands for (i) Process and Project Management; (ii) Partnership and (iii) Products, the three dimensions evaluated at the middle and at the end of the project lifecycle.



The questionnaires developed by ISQ for transnational project meetings are organized around three main moments: *before* (meeting preparation), *during* and *after* the meeting. Additional dimensions evaluated are *attendance* and *technical discussions*. Please see next section for the evaluation results of the first TPM – the kick-off meeting.

LEARNING, TEACHING, TRAINING ACTIVITIES

The teaching and training activities play an important role in achieving the objectives of SUSTAIN-CE. They will take the form of one train-the-trainers event (C1) and three training academies (C2, C3 and C4). These academies constitute part of the quadruple helix co-creation process.

The new innovative curriculum developed for the design courses in selected areas of civil engineering will be tested in the three training academies. Each training academy will have a different thematic. The anticipated thematises that will be evaluated and finalized in O1, to be covered in the academies are as follows:

- C2 will focus on **water resources** and **transportation engineering**,
- C3 will focus on **construction materials and buildings** and
- C4 will focus on **structural and geotechnical engineering**.

In each of the academies, trainees selected at a national level (junior and senior undergraduate students, recent graduates and professionals) and partner experts as trainers/mentors, will collaborate and test the training material developed in O2 and the training methodology (O3) and co-design a selected civil engineering project using SD/CE applications on the chosen thematic of the academy. The effect of SD/CE concepts on the design process will be evaluated. After each Training Academy, the organizing partner will assess the results of the academy and will produce a thorough evaluation report, in order to reengineer and further improve the course contents related to SD/CE and the deliverables of O2 and O3.

Moreover, in C3 and C4 the SUSTAIN-CE VLE platform, developed for offering open and distance learning opportunities to a broader audience of trainees will be piloted during the trainings. Therefore, the Training Academies will also enable the improvement of the VLE platform based on the feedback comments of the trainees and the trainers.

MULTIPLIER EVENTS

Three multiplier events will be organized to promote and disseminate the results of the project. The first two will be organized in combination with the scheduled training activities (trainers' lab and the three training academies) in different partner countries. The third multiplier event will be in the form of a Final Conference disseminating the final outputs of the project and opening the floor for a discussion on the recent trends and further developments in the fields of Sustainable Design and Circular Economy. The final multiplier event will take place at the same time with the last Transnational Project Meeting in Izmir and therefore representatives of each partner will be able to attend and contribute to it.

Multiplier events not only provide feedback to the project but also reverse-feedback to these stakeholders and increase their awareness. It will force them to think and ask questions on the subject. Therefore, in the short-term a change in their approach to the SD and CE could be expected. In the long term, the developed sensitivity is expected to steer their decisions to SD and CE friendly actions. The civil engineering graduates that go through the new innovative curriculum will be able to perform the necessary tasks with the new approach. The local people, economy and the environment will benefit from these changes.



3 PROJECT ACTIVITY FOR THE PERIOD UNDER EVALUATION

In the period concerning this evaluation the consortium met two times, namely:

- i. for the **3rd Transnational Project Meeting**, held in Lisbon on the 15th and 16th of March.
- ii. for the **4th Transnational Project Meeting**, held in Thessaloniki on the 22nd to 24th of June.

Following each transitional project meeting, two learning activities took place in each country:

- a. **C2** – first learning activity- took place in Lisbon from the 15th to the 17th of March.
- b. **C3** - second learning activity- happened in Thessaloniki, from the 22nd to the 24th of June.

4 QUALITY RESULTS FOR THE PERIOD UNDER EVALUATION

4.1 Transnational Project Meetings

Table 2 presents all meetings held from June to the end of December 2021.

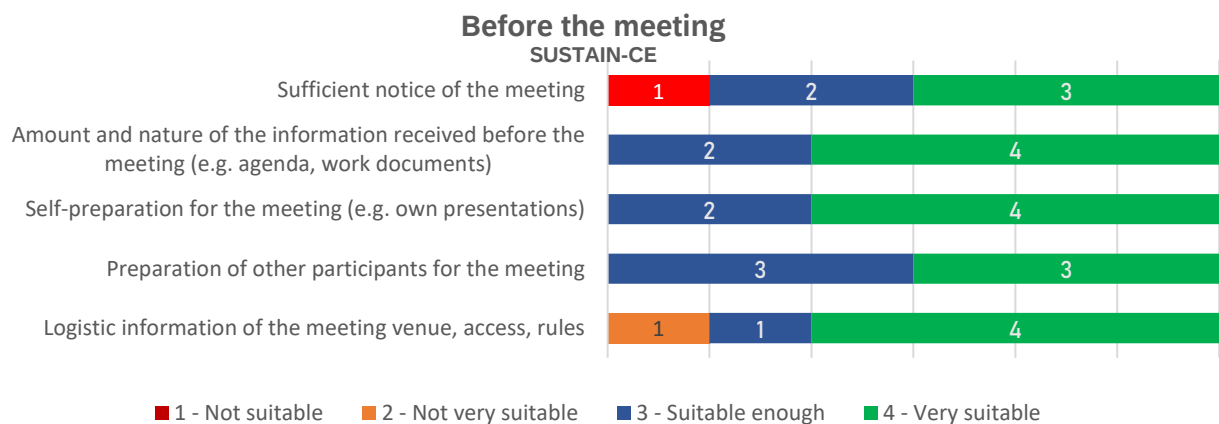
MEETING	DATE
3 rd TPM - Lisbon	15&16/Mar/22
4 th TPM - Thessaloniki	22-24/Jun/22

4.1.1 3rd Transnational Project Meeting, Lisbon, 15th and 16th March 2022

Graphs 1 to 4 show results obtained for the evaluation of the third TPM.

Overall, it was very positively evaluated by all partners, with no negative ratings given to any individual aspect. The “During the meeting” dimension was particularly positively evaluated, with all but one question rating the highest value possible of satisfaction. The “after the meeting” was the best rated dimension, with all partners replying with “very suitable” to all questions.

Box 1 shows results obtained for the open question (comments and suggestions).

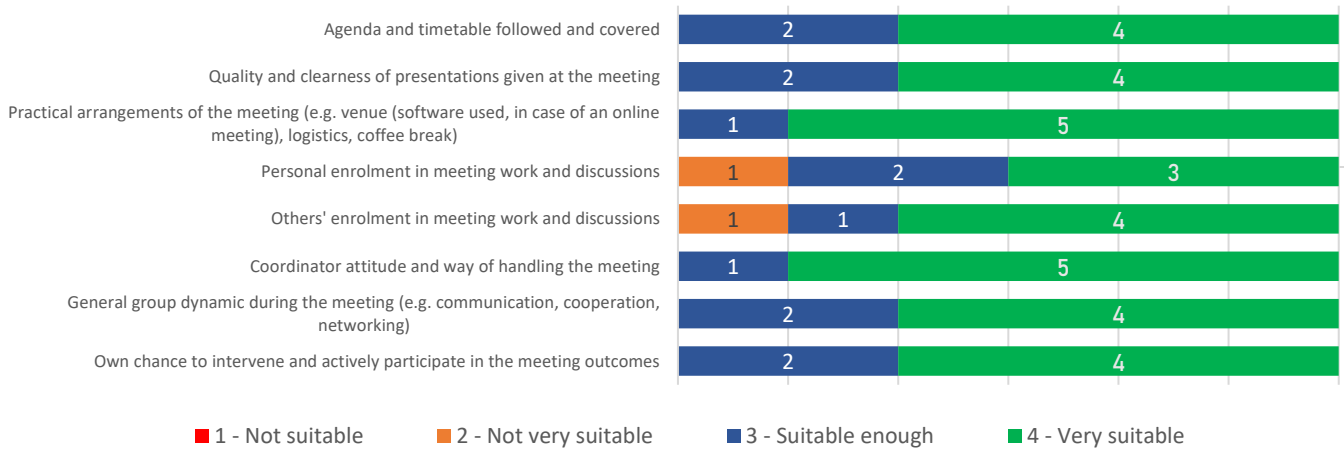


Graph 1



During the meeting evaluation

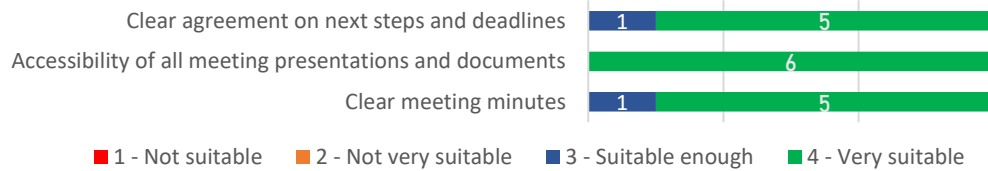
SUSTAIN-CE



Graph 2

After the meeting

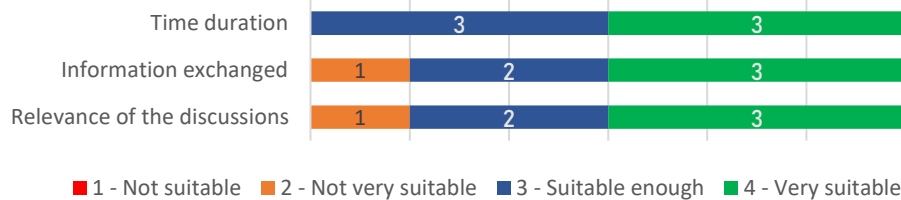
SUSTAIN-CE



Graph 3

Technical discussions

SUSTAIN-CE



Graph 4

Box 1: Comments regarding TPM3

Comment 1

Everything was perfect

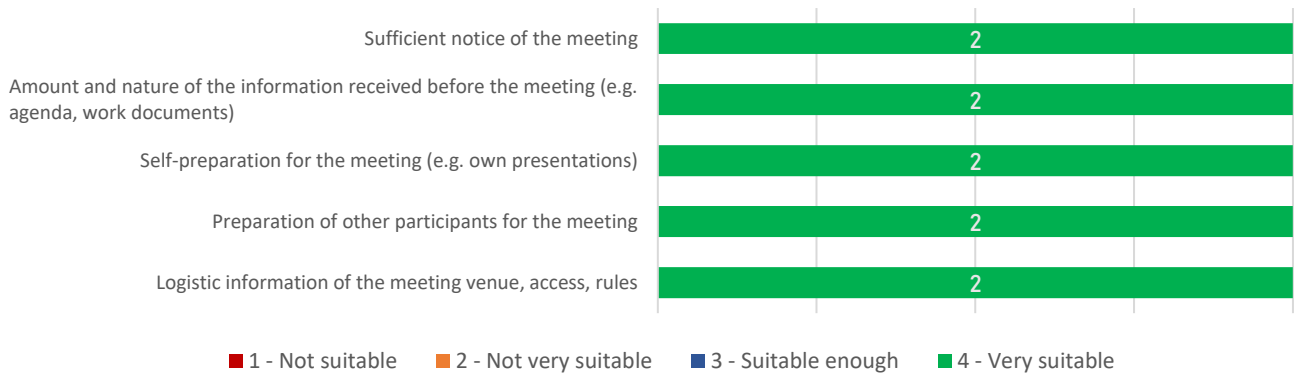
4.1.2 4th Transnational Project Meeting, Thessaloniki, 22th to 24th June 2022

Graphs 5 to 8 show results obtained for the evaluation of the fourth TPM.

Overall, it was very positively evaluated by all partners, with no negative ratings given to any individual aspect.

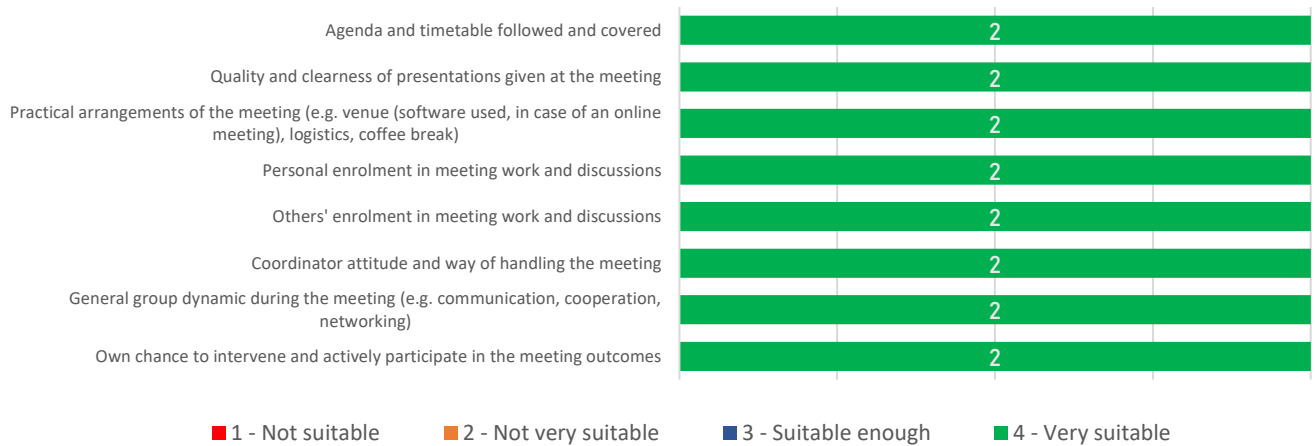


Before the meeting SUSTAIN-CE



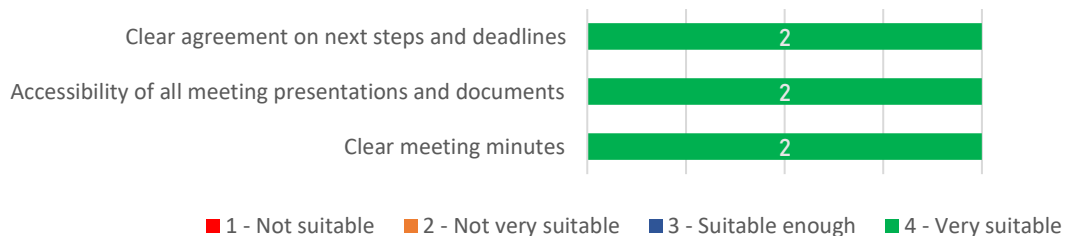
Graph 5

During the meeting SUSTAIN-CE

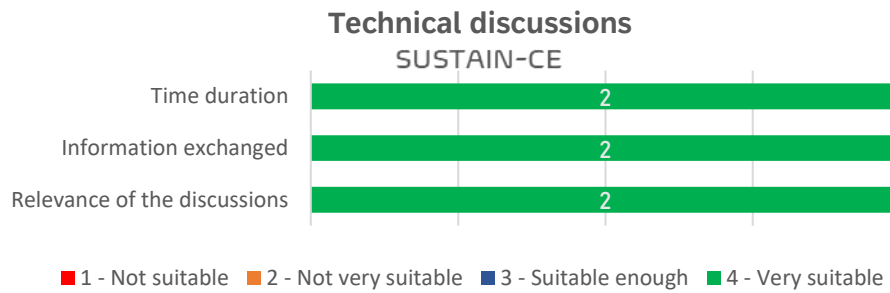


Graph 6

After the meeting SUSTAIN-CE



Graph 7



Graph 8

Box 2: Comments regarding TPM4

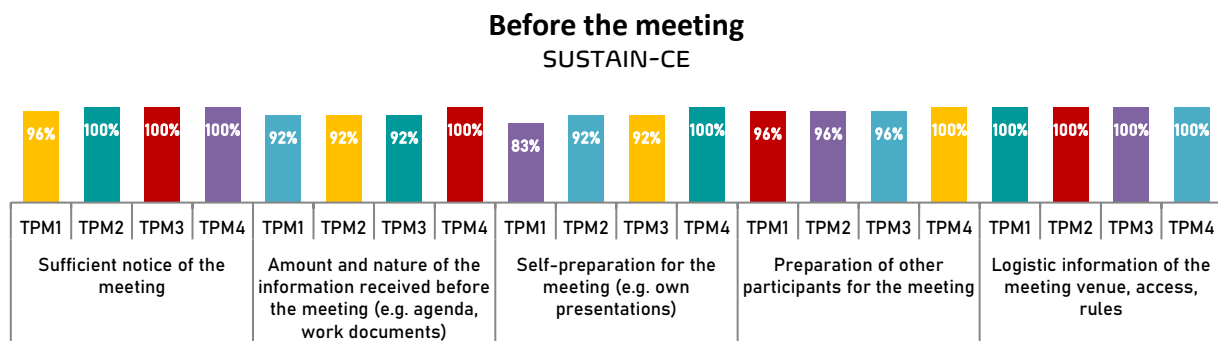
Comment 1

Evaluating as YASAR University feels kind of strange since we are the ones organizing the meeting.

4.1.3 Transnational Project Meetings Evaluation Evolution

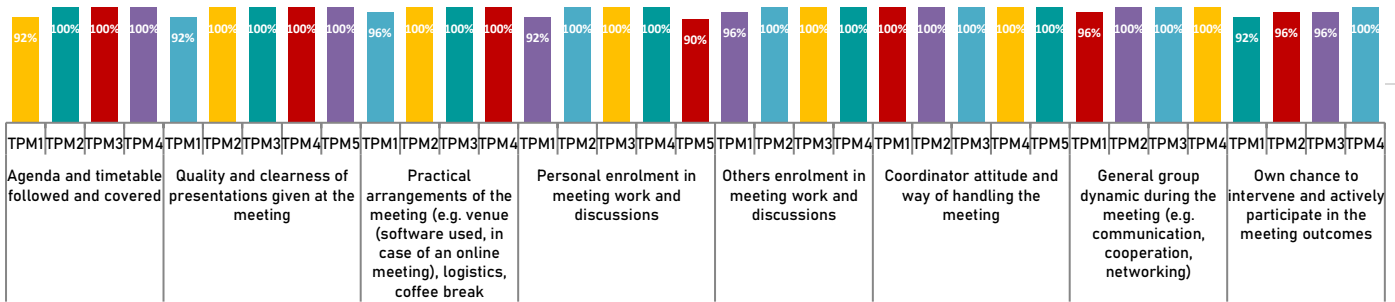
The quality evaluation and monitoring methodology developed by ISQ also considers evaluating how the several aspects evaluated in each questionnaire evolve throughout the project. This section looks at how the main dimensions evaluated for TPMs, namely (1) *before the meeting*, (2) *during the meeting*, (3) *after the meeting* and (4) *technical discussions*, have been rated from one meeting to another.

Graphs 9 to 13 depict results obtained for each dimension in the two transnational project meetings held so far, and Graph 13 shows the average satisfaction level scored by each meeting.



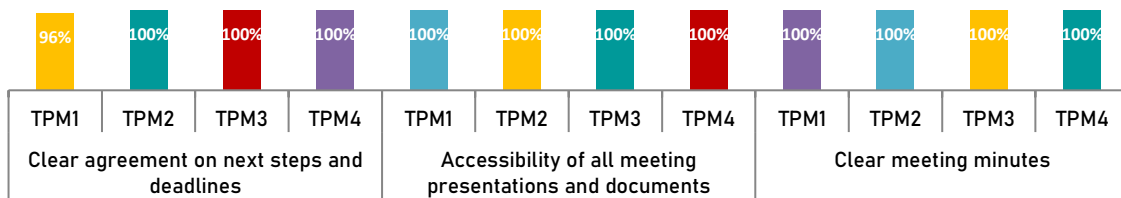
Graph 9

During the meeting SUSTAIN-CE



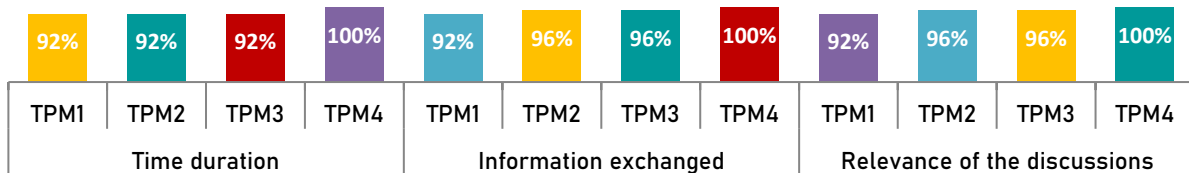
Graph 10

After the meeting SUSTAIN-CE



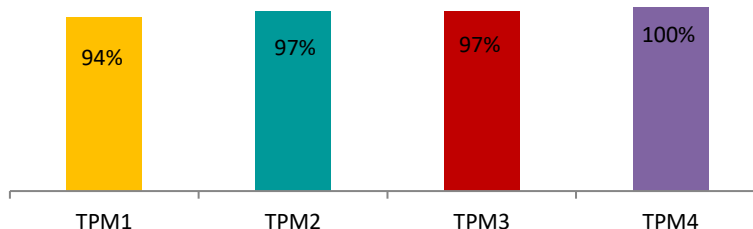
Graph 11

Technical discussions SUSTAIN-CE



Graph 12

Global average evaluation of each Consortium Meeting SUSTAIN-CE



Graph 13

This global evolution results show there's no major issues to be tackled. The SUSTAIN consortium is aligned and working together to deliver the SUSTAIN project objectives in time and with the desired quality standards. This positive evolution between TPM's also shows the transnational project meetings are an important and fruitful event.

4.2 Training activities

C2 – 1st Training Academy (C2) evaluation - Lisbon, 15th – 17th March 2022

The questionnaire designed by ISQ for the evaluation of training activities, accounts for the following sub-dimensions:

- Participant's profile: professional background and main interest in participating (2 questions)
- Content Delivery (7 questions)
- Partnership evaluation (30 questions – 5 per partner)
- General satisfaction (5 questions)
- 2 open questions (comments, suggestions, etc.)

C3 – 2nd Training Academy (C3) evaluation – Thessaloniki, 22nd to 24th June 2022

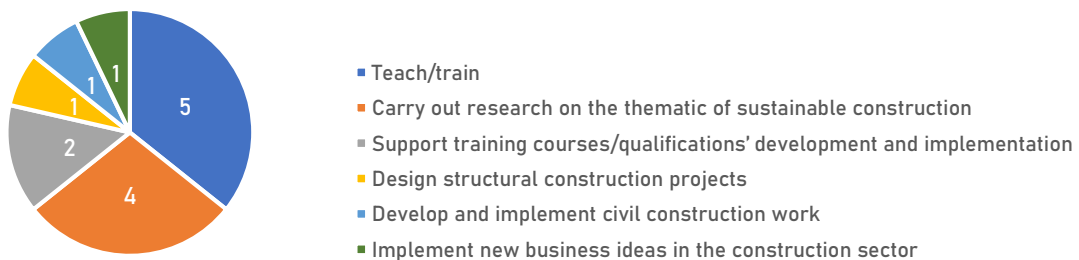
The questionnaire designed by ISQ for the evaluation of training activities accounts for the following sub-dimensions:

- Participant's profile: professional background and main interest in participating (2 questions)
- Content Delivery (7 questions)
- Partnership evaluation (40 questions – 5 per partner)
- General satisfaction (5 questions)
- 2 open questions (comments, suggestions, etc.)

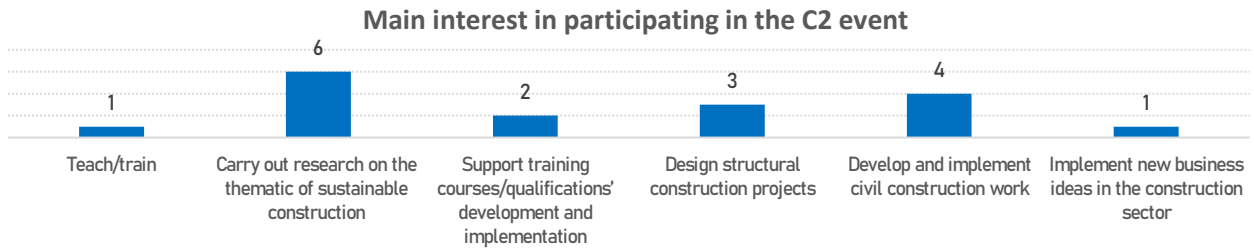
4.2.1 C2 - 1st Training Academy

Graphs 14 and 18 depict results obtained for the first two questions on the C2 participant's profile.

In your job, your role is mainly to...



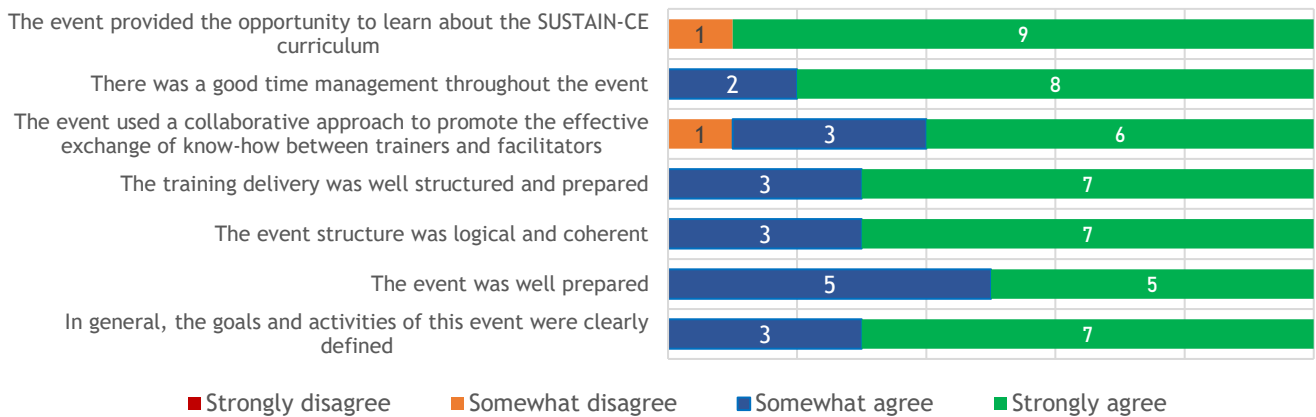
Graph 14



Graph 15

Graph 16 shows the results obtained for question 3 (**content delivery**), which got two negative evaluations, one in respect to the question “*The event used a collaborative approach to promote the effective exchange of know-how between trainers and facilitators*” and another to the question “*The event provided the opportunity to learn about the SUSTAIN-CE curriculum*”. The comments (*in box 3*) shed further light onto the possible explanations for this result. Partners highlighted aspects that they would like to see done differently in the next training academies, such as more interaction between trainers and trainees and additional involvement of students. This could explain the lower evaluation of the collaborative approach between trainers and facilitators and should be considered for the next training sections.

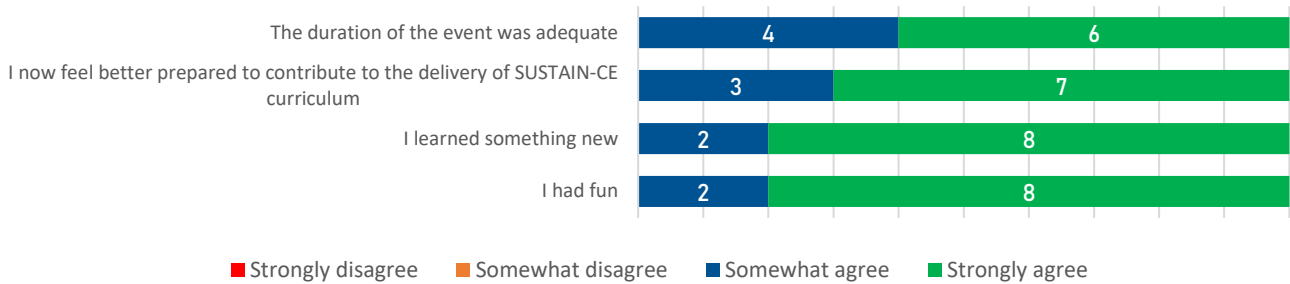
Content Delivery



Graph 16

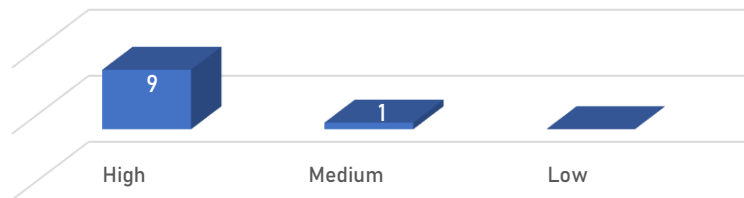
As for the questions evaluating general satisfaction, the results were, overall, very positive, with only one person rating a medium level of satisfaction (see Graph 17). Although, it is difficult to pinpoint with certainty the reasons behind this evaluation, looking at the results depicted in Graph 17, this could be related with the duration of the event or the knowledge of the SUSTAIN-CE curriculum.

General satisfaction



Graph 17

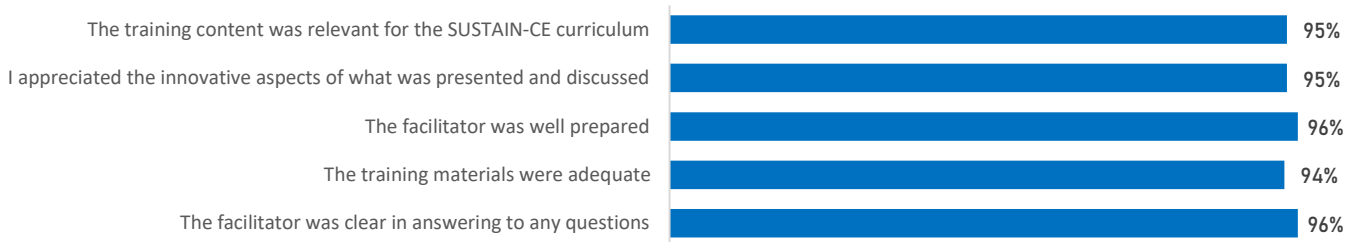
How would you rate your level of satisfaction with this event?



Graph 18

Graph 19 depicts the results obtained for the partners evaluation by their peers. Considering the subdimensions in which the partners were evaluated, their overall performance was much appreciated, with all ratings around 95%. The preparation of the facilitators and their clearness in answering questions were the best evaluated factors. Just below the 95% mark stands the evaluation of the suitability of training materials.

Partners Evaluation



Graph 19

The evaluation questionnaire included a space for participants to share their vision of the most positive aspects, as well as aspects they would like to see done differently on other training activities of the learning activity.

Box 3: Answers to the question "What was the most positive aspect of this workshop? Why?"

Comment 1

Very interesting presentations from experts inside the partners' organisation and for external experts.

Comment 2

To experience the academy in real

Comment 3

New insights on how to move with curriculum

Comment 4

Interaction between the individuals, it opens new avenues in the approach.

Comment 5

The diversity of the approaches: Lectures coming from different aspects of the transportation curriculum

Comment 6

Coordination, sustainability

Box 4: Answers to the question "What would you like to see done differently for the next training academies?"

Comment 1

Improved interaction between trainers and trainees.

Comment 2

I would like more students to be involved in the academy.

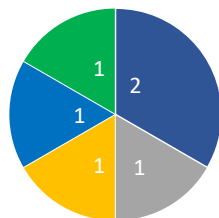
Comment 3

Additional areas of interest.

4.2.2 C3 - 2nd Training Academy

C2 took place in Thessaloniki from the 22nd to the 24th of June 2022. This second training activity was hosted by Aristotle University of Thessaloniki. Graphs 20 and 23 depict results obtained for the first two questions on the C3 participant's profile.

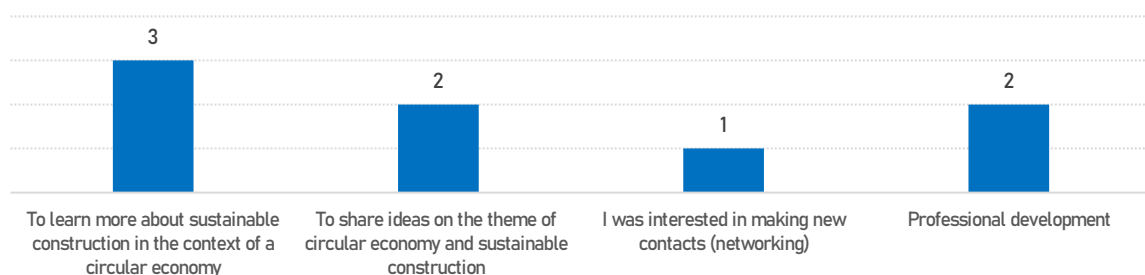
In your job, your role is mainly to...



- Teach/train
- Carry out research on the thematic of sustainable construction
- Support training courses/qualifications' development and implementation
- Design structural construction projects
- Develop and implement civil construction work
- Implement new business ideas in the construction sector

Graph 20

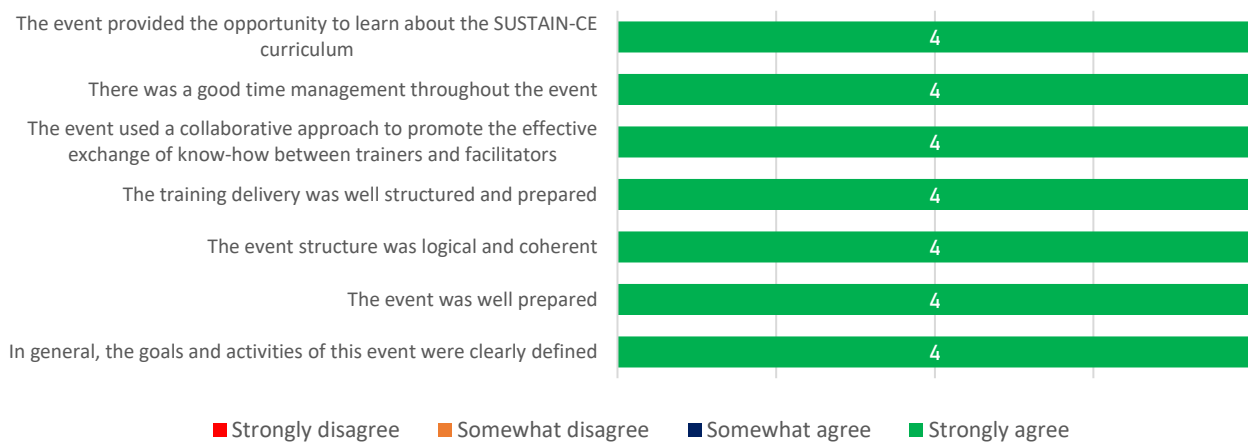
Main interest in participating in the C3 event



Graph 21

Graph 21 shows results obtained for question 3 (**content delivery**), which was very appreciated by the partners. Every item evaluated got a unanimous maximum rating. This satisfaction was further visible in the comment section, with notes such as *“Congratulations on the excellent implementation of the Academy!”* and *“The very interesting selection of presentations with excellent facilitators! 2. The work done with the trainees that collaborated with the facilitator based on the selected case studies!”*. Even though, every sub dimension in this evaluation got the maximum score, there is to note one comment in regard to the sub dimension *“The event used a collaborative approach to promote the effective exchange of knowhow between trainers and facilitators.”* - one partner suggested that more work could be done on case studies to improve the interaction with the trainees. This comment – that was also accounted in C2 evaluation- should be in mind for the next training academies.

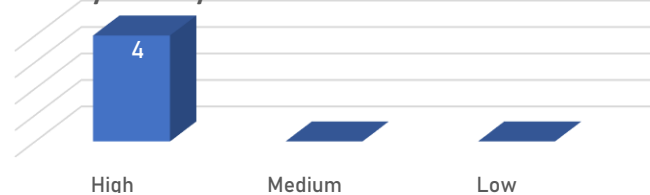
Content delivery - General



Graph 22

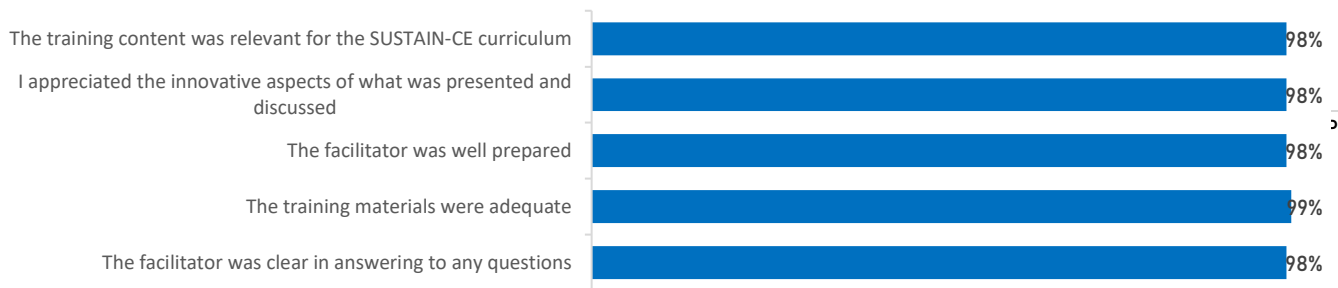
The questions evaluating general satisfaction gathered excellent results, displaying a high level of satisfaction with this event (Graph 22).

How would you rate your level of satisfaction with this event?



Graph 23

Partners Evaluation



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Graph 24

Graph 24 depicts the results obtained for the partners evaluation by their peers. Every partner reported a high satisfaction with the facilitator of this event. The nine trainers were similarly appraised by the attendees. Looking at partners evaluation, all the subdimensions on analysis gathered a high satisfaction scores, with values around 98%. Within the factors in question, the training materials were what got the best evaluation score.

Box 5: Answers to the question "What was the most positive aspect of this workshop? Why?"

Comment 1

The very interesting selection of presentations with excellent facilitators! 2. The work done with the trainees that collaborated with the facilitator based on the selected case studies!

Comment 2

Contents. I learned new ideas

Box 6: Answers to the question "What would you like to see done differently for the next training academies?"

Comment 1

More work on case studies to improve the interaction with the trainees.

Box 7: sole answer to the question "Further comments and suggestions"

Comment 1

Congratulations on the excellent implementation of the Academy!

Comment 2

Everything was well.

5 PERFORMANCE INDICATORS

Table 4 depicts results for the performance of the quality indicators applicable (bound to be evaluated) in the current state of the project. These are classified according to a 3-colour scale:

- (1) **Green** for absolute compliance
- (2) **Amber** for minor deviations
- (3) **Red** for unaccomplished targets



IO/Activity	LEADER	PI	RATING
IO1	SEERC	<p>1.1. A quadruple-helix co-creation methodology is created identifying, at least 24 best practices;</p> <p>1.2. Three stakeholders' lists (1 per country) are created;</p> <p>1.3. Minimum of 120 responses, in total, from project stakeholders to the skills gap survey;</p> <p>1.4. Minimum of 60 best practices, in total, on a global or national level, are identified by partners on a benchmarking exercise of SD/CE;</p> <p>1.5. One focus group per country (three in total) is formed to confirm and further elaborate on the skills matrix and benchmarking results;</p> <p>1.6. The blueprint has recommendations for the new innovative curriculum be compatible with ECTS, ECVET and EQAVET systems;</p> <p>1.7. Partners are satisfied by the time of the Final Output quality check (all positive feedback);</p> <p>1.8. All partners evaluate the IO leadership in a positive way.</p>	
IO2	IYTE	<p>2.1. A list of SD/CE concepts is produced by the academic partners and incorporated to existent courses of Civil Engineering Curricula, for each of the previous selected thematics;</p>	
Project management	YU	<p>6.3. Ate least, two "catch-up" virtual project meetings are organised during the project lifetime;</p> <p>6.4. TPM meeting agenda sent to all partners at least 3 weeks before the meeting;</p> <p>6.5. Virtual project meetings sent to all partners at least 1 weeks before the meeting;</p> <p>6.6. Meeting minutes sent to all partners within 2 weeks after the meeting;</p> <p>6.7. To-do lists updated every 3 months;</p> <p>6.8. All partners evaluate the project meetings in a positive way2;</p> <p>6.9. All partners evaluate the management model in a positive way2;</p> <p>6.11. Minimum 85% positive feedback from partners concerning Project Coordination & Management (management, communication, coordination capabilities);</p> <p>6.12. Minimum 85% positive feedback from partners concerning internal communication process (platforms, shared drive, etc.);</p> <p>6.13. Minimum 85% positive feedback from partners concerning project's Financial Management;</p> <p>6.14. Financial reports sent by partners to the coordinator according to the schedule.</p>	
Dissemination and Exploitation	YU	<p>7.1. The project website is created within the first six months of the project;</p> <p>7.5. At least, 2 project e-newsletters are released, per year, by the partnership during the project lifetime;</p>	



		7.6. Minimum of three social media channels, for dissemination purposes, are identified and used during the project lifetime (Facebook, LinkedIn, Twitter and other(s));	
Quality and Evaluation	ISQ	8.1. Quality and Evaluation Handbook with inputs from all partners; 8.2. All partners answer to the evaluation tool for the project meetings; 8.3. All partners answer to the evaluation tool for the project annual assessment focused on 3P model; 8.8. Interim Evaluation report delivered on time;	

All performance indicators have been complied, representing dedicated partnership.

6 FINAL REMARKS

In short, the third project meeting only gathered one negative evaluation in all the dimensions in analysis – and one that did not impact a 97% evaluation rating. The 4th meeting also performed excellent, contributing to a meetings evolution that translated in consisting, and at most times, progressing performance levels. In respect to the first learning activity, there were two negative evaluations regarding the “Content delivery” dimension, yet this event gathered an overall 94% performance level. Following this trend, the second learning activity also presented excellent results.

Thus, the first half of the second year of the SUSTAIN project further confirmed the good relation between all partners. Altogether, the beginning of this second year of partnership reveals a positive and well working consortium, as all the aspects under evaluation display good, and at most times, excellent performance levels.