



Climate Virtual Exchange: Enhancing Climate awareness
in Europe and the South Mediterranean Area

D5.2 Overall Sustainability Assessment Report



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About CLiVEx

The overarching goal of CLiVEx - Climate Virtual ExChange: Enhancing climate awareness in Europe and the Southern Mediterranean Area, is to enhance intercultural dialogue between students from Europe and the Southern Mediterranean area on the topic of climate change.

Consortium members

- UNIMED, Mediterranean Universities Union, Italy – coordinator
- SPF, Sharing Perspectives Foundation - The Netherlands
- SOLIYA, Association Soliya Tunisia - Tunisia
- UNIPD, Università di Padova - Italy
- ANNU, An-Najah National University - Palestine
- LIU, Lebanese International University - Lebanon

More at <https://clivex.eu>



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Executive Summary

The Climate Virtual Exchange (CLiVEx) project successfully brought together students from Europe and the Southern Mediterranean over five iterations (Spring 2024 – Spring 2026), fostering intercultural dialogue on climate justice while demonstrating the educational and environmental value of virtual exchange.

The project attracted 2,015 registrations for the Virtual Exchange on Climate Justice, of which 1,595 participants were active and 1,460 met the European Commission's eligibility criteria. Students were drawn from 16 countries across both regions, and a dedicated Diversity Index ensured that each dialogue group closely reflected the overall population in terms of gender, age, and regional background.

Learning outcomes were measured through pre- and post-exchange surveys aligned with the EU's GreenComp framework. Results showed significant improvements particularly in Embodying Sustainability Values and Acting for Sustainability, with 99% of participants reporting gains in skills and knowledge, including climate justice awareness, collaborative and intercultural communication skills, and English proficiency. These findings were further supported by consistently high satisfaction rates, exceeding 90% across all five iterations, with facilitators receiving the highest praise.

This report also provides an assessment of the Online Dialogue Facilitation training which attracted 1,918 applications, of which 1,723 were eligible participants and 1,141 actually participated in training.

Beyond its educational impact, the project conducted a Life Cycle Assessment comparing the carbon footprint of online versus in-person learning. The results were striking: the online format produced just 0.78 kg CO₂e per student-hour, compared to 5.16 kg for the in-person course — a difference of 6.6 times — with international air travel accounting for the vast majority of in-person emissions.

These findings collectively position CLiVEx as both a high-impact pedagogical model and an environmentally responsible approach to international education.

Document Information	
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Introduction

CLiVEx is a dialogue-based virtual exchange which brings together students from different parts of the world to engage with materials related to climate justice, to participate in weekly facilitator-led dialogue sessions and to collaborate with peers on a project related to climate justice. Five iterations of this exchange have run since Spring 2024, ending with the last round in Spring 2026.

This Overall Sustainability Assessment Report outlines the impact of CLiVEx over the course of the project, drawing on data gathered through the tools used to evaluate student and facilitator learning (see Evaluation Handbook) and a Comparative Carbon Footprint to assess the environmental impact/sustainability of the project.

This report starts by reporting on the participation and engagement in the CLiVEx project, the regional diversity embodied by the project and performance - in terms of successful completion of the exchange with the award of badges. It then moves to look at participants' learning as measured through pre- and post-exchange surveys in which participants' self-reported knowledge and competences related to the European Commission's Greencomp tool. This is followed by reporting on participant satisfaction with the overall course as well as after each session, with quantitative data as well as a section with participants' comments on the exchange. The facilitation training was also a key component of CLiVEx and evaluation and impact of this is also included in the report. We then look at the carbon footprint of the programme. The report concludes with recommendations.



Participation and engagement in CLiVEx

Spread across five programme iterations, the Climate Justice: From Inequality to Inclusion virtual exchange received 2015 registrations from participants. Within each iteration, registered participants were organized into smaller groups (between 19 and 25 groups per iteration) based on their availability to meet in synchronous dialogue sessions, with the aim to create maximum diversity in terms of gender and geographical spread. These smaller groups met weekly for 2 hours on the same day and time, with the same students and facilitators. With a smaller number of peers from these same groups, students collaborated on the Climate Action Project. Thus, while the project engaged hundreds of participants in each iteration, the participants themselves only interacted with those in their own dialogue group.

Across the various iterations, participants were recruited by the following (associate) Partner Institutions in the CLiVEx project:

- Algeria: Biskra University
- Algeria: Mohamed Lamine Dabbaghine Universite Setif 2
- France: Université de Bordeaux
- Egypt: Deraya University,
- Germany: Julius-Maximilians-Universitat Wurzburg
- Ireland: Munster Technological University
- Ireland: University of Limerick
- Ireland: Trinity University
- Italy: Università degli Studi di Padova
- Jordan: National University College of Technology
- Libya: University of Benghazi
- Morocco: Universite Abdelmalek Essaadi
- Netherlands: Hogeschool Utrecht / Utrecht University of Applied Sciences
- Palestine: An-Najah National University
- Palestine: Bethlehem University
- Palestine: Palestine Polytechnic University
- Portugal: Universidade de Trás-os-Montes e Alto Douro
- Spain: Universitat de Girona
- Tunisia: Institut National de Recherche et d'Analyse Physico-Chimique

The vast majority of participants took part in the virtual exchange as an accredited module within their university curriculum at the BA level, with a smaller group consisting of MA and PhD students.

Partners recruited participants in various frequencies. Some partners took part in only one iteration, others only in certain semesters while most did recruit for each iteration. Some (associate) Partner Institutions were unable to actively recruit participants of the virtual exchange at all due to various reasons:

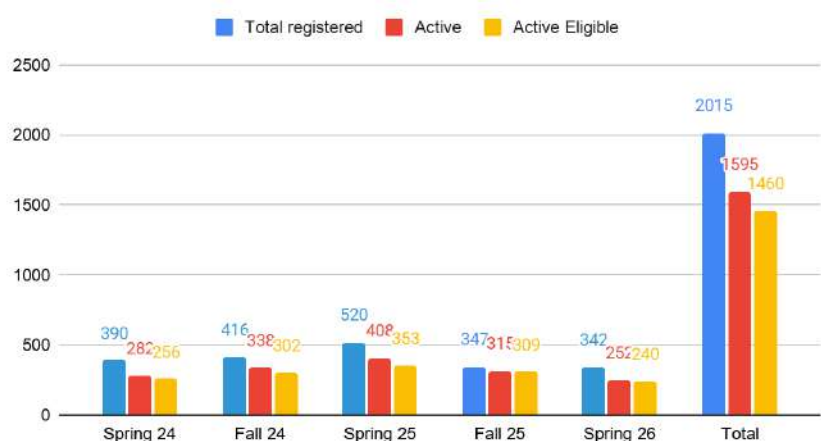
- The nature of some partner organisations and their role in the project (UNIMED being a university network and SPF & Soliya being NGOs).
- The difficulty to engage some local coordinators (Alexandria University and Al-Sham University) who had previously committed to participate in the project.
- The ongoing genocide in Gaza, the bombing of one partner, the Islamic University of Gaza, and the severe humanitarian situation preventing them from operating at this time.

1.1 Active eligible participants

According to the European Commission's eligibility criteria for the CLiVEX project, participants must be no older than 30 years and must reside in one of the project's partner countries (countries where the CLiVEX project has partner organizations).

We define being active in the programme as having at least logged into the learning management system once. This means that active participants have acted upon their registration and the invitation to participate into the Climate Justice course. We see in Figure 1 that from the total of 2015 registered participants, 1595 (79%) were active participants. The level of dropout from registration to active participant varied across the iterations (72% - 91%). It must be noted that a large part of the dropout from registration to active students was mainly caused by two specific partners and the varying number of participants these institutions recruited. The project coordinators worked with these partners to decrease this dropout rate but were not able to consistently improve this number over time.

1. Registered, active & eligible participants



If we look at the eligibility criteria of the European Commission, from the 1,595 active students, 1,460 were eligible as they were between 18-30 years old and resided in one of the partner countries. The project accepted these 'ineligible' participants to take part in the programme as they came as part of the partner recruitment mechanisms. Partners were unable to discriminate based



on age or country of residence as they needed to be able to offer this opportunity to specific learner cohorts that did not have these age or residence criteria. To enable partners to effectively recruit participants, we agreed that they should aim to recruit within the eligibility criteria but if certain participants from partners were outside these criteria but came as part of the group they recruited from we would allow them to participate. Not doing so would have resulted in discrimination on the part of the institution.

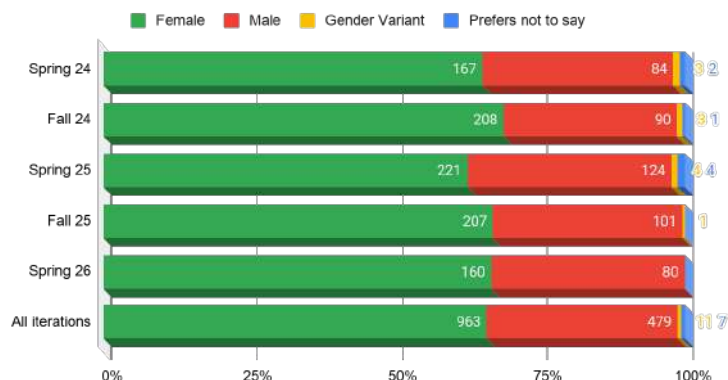
Demographics of active eligible participants

Before discussing the performance of active eligible participants in the course we will look at their demographics.

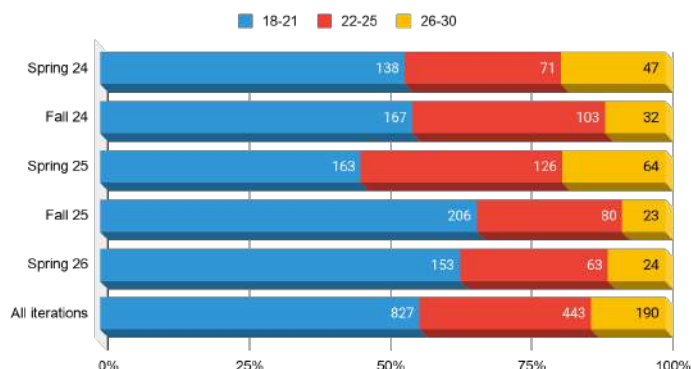
Gender

Through all iterations of the programme there has been on average twice the number of female participants as male.

2. Gender



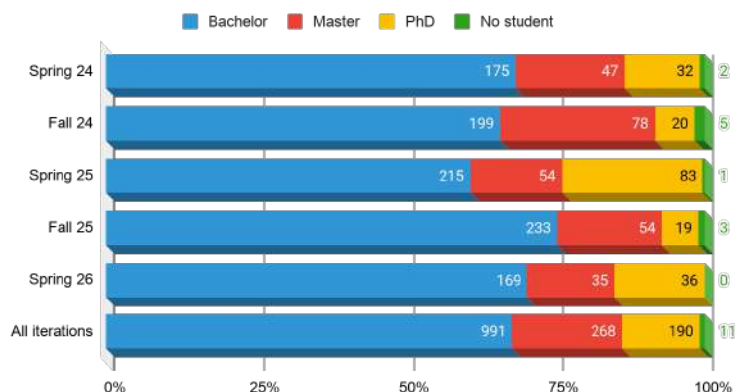
3. Age



Degree level

The highest numbers of participants were BA students, followed by MA and then PhD students .

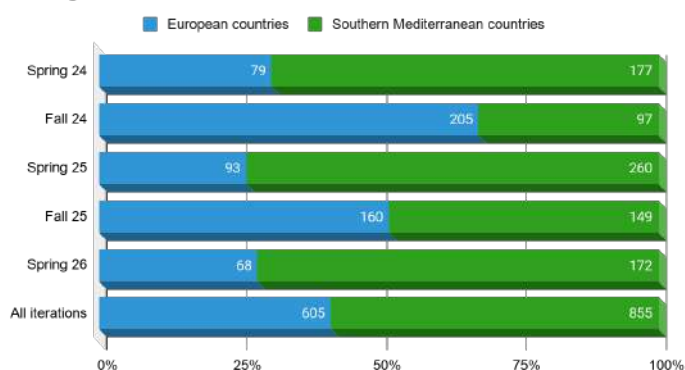
4. Degree level



Regional residence

In terms of regional participation, with the exception of Fall 2024, there were higher numbers of participants from Southern Mediterranean countries than European ones. The difference between Spring and Fall iterations are caused by the absence of one EU partner who can only offer the opportunity in the Fall semesters but does so with a high number of active students.

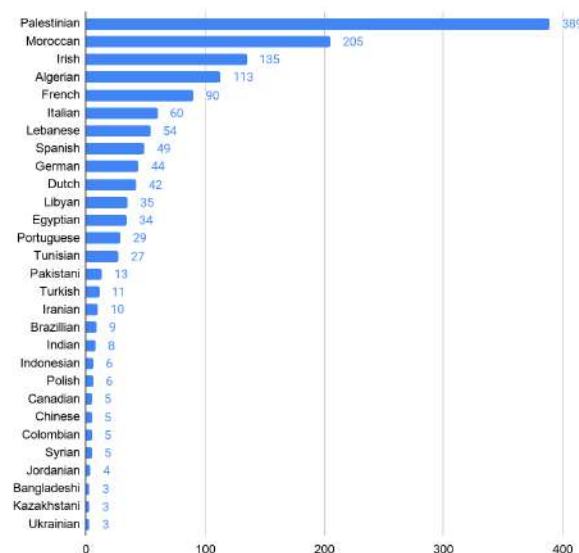
5. Regional residence



Nationalities

In total we had participants from 73 different nationalities. The strongest represented nationality was Palestinian (389), followed by Moroccan (205) and Irish (135). Most nationalities reside in their own region, with some exceptions where international students from mainly our European partners took part in the programme. The participants with a nationality that does not confirm to the countries eligible for participation in this programme, were residing in an eligible country at the time of registration and registered through our partner organisations. For legibility only nationalities with more than 2 participants are represented in figure 6.

6. Nationalities





Diversity Index

In order to make sure we offer our participants a truly enriching experience we developed a diversity index on which to score groups, so that we could ensure the diversity of the groups was as close as possible to the diversity of the overall participant population. For each category of diversity (gender, partner, region, age), the percentile of the group is deducted from the percentile of the whole population (so, in case of gender, say the whole population has 0.6 women, and the group has 0.4, this would be 0.2). To construct the diversity index we take the mean of the absolute value of these numbers for each category. This produces a number between 0 and 1, 1 meaning that the group has no diversity at all, and 0 meaning that group is a perfect representation of the diversity of the whole participant population. We then used this metric to make sure that all the groups matched the overall population as closely as possible.

Student performance

It is worthwhile to understand student performance in the virtual exchange.

Students could score a maximum of 100 points, allocated as follows:

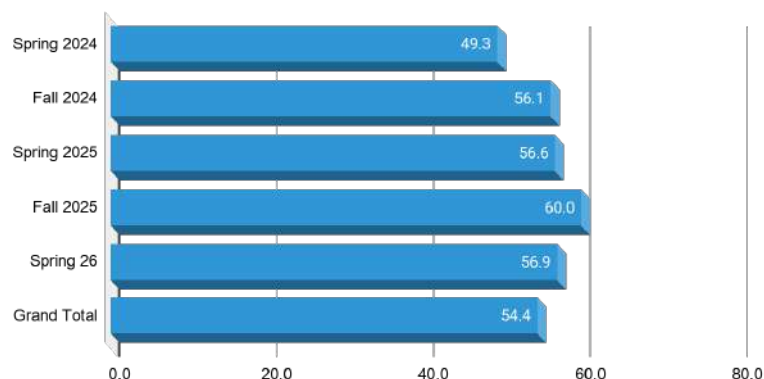
- Attendance at dialogue sessions (timely attendance) – maximum 35 points
- Submission of preparatory assignments in response to the curriculum – maximum 10 points
- Submission of reflection journals on the exchange process – maximum 10 points
- CAP assignment – maximum 45 points

The average score of active participants fluctuates, from 49.3 in Spring 2024 to 60 in Fall 2025 (see Fig. 7).

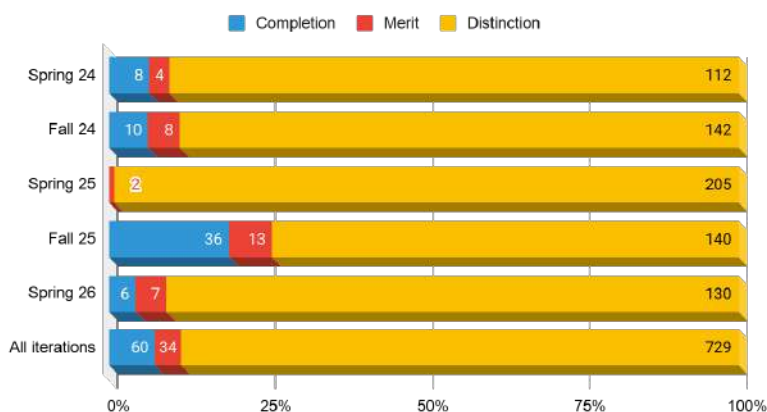
To be eligible to receive a Badge of Completion, students must score at least 40 points and attend 8 out of the 10 dialogue sessions. To score 40 points, participants have attended 8 out of 10 dialogue sessions (27 points if sessions were attended on time) and submitted at least 13 out of 18 resource response and reflection journals.

Of the total number of active participants, across all iterations, 729 scored 80 points or higher, making them eligible for a Badge of

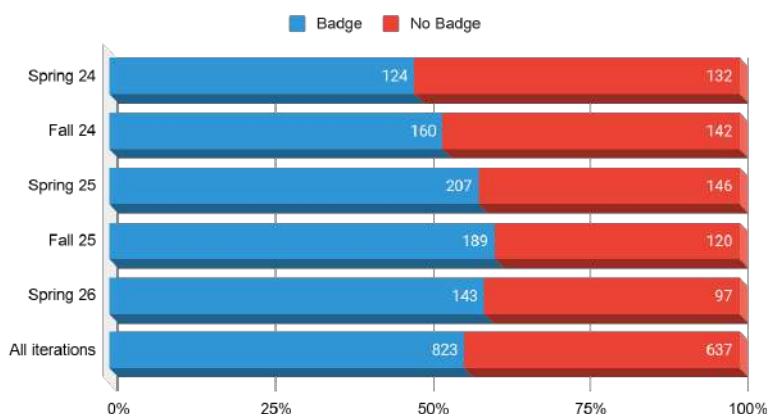
7. Average grade



8. Badge levels



9. Successful course completion





Completion with Distinction, while another 34 (%) scored more than 60 points, making them eligible for a Badge of Completion with Merit and 60 (%) scored more than 40 points granting them a badge of Completion (see Fig. 8).

Evaluation of cohort learning through Virtual Exchange

The aims of the CLiVEx project were to enhance participants' climate awareness and transversal skills and competencies, such as global awareness, digital literacy, effective communication skills, leadership and collaboration, intercultural sensitivity, social responsibility, and sustainability competences.

We used pre- and post-exchange surveys to measure changes in participants' knowledge, attitudes, and behaviours related to CLiVEx programme aims. This approach was also adapted in the Erasmus+ Virtual Exchange pilot project and provided insights into the impact of the programme¹. The surveys began by asking participants about their previous experience with virtual exchange and international study. This was followed by questions related to environmental sustainability. The post-evaluation surveys repeated the pre-survey items, together with additional post-survey items, including open questions that allow participants to provide further details on their learning, satisfaction and challenges with the exchanges. These surveys were used with five cohorts of CLiVEx participants. (Full details of evaluation tools are available in the Evaluation Handbook)

Pre and post-exchange tool

The starting point in developing items for the survey related to learning about environmental sustainability was the European Commission's GreenComp², "a framework for learning for environmental sustainability that can be applied in any learning context" developed by the European Commission. GreenComp set out to identify a set of sustainability competences to feed into education programmes and to "help learners develop knowledge, skills and attitudes that promote ways to think, plan and act with empathy, responsibility, and care for our planet and for public health".

The GreenComp Framework comprises four interrelated competence areas: 'embodying sustainability values', 'embracing complexity in sustainability', 'envisioning sustainable futures' and 'acting for sustainability'. Each of these comprises three competences that are interlinked and equally important. Descriptors for these competences are provided in the framework and examples

¹ <https://op.europa.eu/en/publication-detail/-/publication/34293a1f-45ca-11ec-89db-01aa75ed71a1/language-en>

² <https://publications.jrc.ec.europa.eu/repository/handle/JRC128040>

of knowledge, skills and attitude are provided. In the pre- and post-evaluation tool developed for CLiVEx we sought to include at least one item based on each of these competences (see Evaluation Handbook for items). We adapted some of the GreenComp descriptors into statements that participants have to state their level of agreement using a 5 point Likert scale. We also developed some statements that focus on the extent to which climate justice is a key concern for the students - given the geo-political situation and the other challenges participants may be facing in their lives. An additional issue we decided to address was the question of responsibility and inequality in relation to climate justice and the global north-global south divide, issues not addressed in GreenComp.

Dependent Variable	Spring 2024 (n=101)	Fall 2024 (n=199)	Spring 2025 (n=175)	Fall 2025 (n=106)	Spring 2026 (n=68)
Embody	0.74	0.64	0.96	0.61	0.51
Embrace	0.43	0.33	0.30	0.20	0.26
Envision	0.12	0.09	0.32	0.21	0.01
Acting	0.69	0.69	0.71	0.67	0.65

Table 1. The effect size of the change in the pre- post-survey items in the four competence areas identified by Greencomp. Effect sizes printed in bold are significant at $p < 0.001$

Each iteration was evaluated separately. The greencomp scales were validated through confirmatory factor analysis after the third iteration.

In looking at change in participants' knowledge/competences (Table 1), the mean difference between post and pre measurement for all attitude items was measured and analysed for statistical significance and effect size. Effect size has been used as a measure of effective change for several studies on mobility and also virtual exchange. In the Stevens' Initiative report (2019), effect sizes of at least 0.2 were considered a reasonable threshold for reporting small effects. In the Erasmus+ Virtual Exchange Impact Study (2021) effect size was also used to measure attitudinal change. In the table above, the statistically significant effect sizes appear in bold.



The two competence areas consistently showing the largest effect sizes were **Embodying Sustainability Values** — reflecting personal worldviews and value systems — and **Acting for Sustainability**, which encourages both individual and collective action and fosters accountability. **Embracing Complexity in Sustainability**, encompassing systemic and critical thinking capacities, also yielded relatively high effect sizes across most iterations. The smallest change was observed in **Envisioning Sustainable Futures**, which focuses on imagining and constructing alternative future scenarios.

Satisfaction

Overall, satisfaction was very high - above 90% across almost all aspects (see table 2). Facilitator satisfaction was the highest, followed by overall course satisfaction across all iterations.

Satisfaction scores	Spring 2024	Fall 2024	Spring 2025	Fall 2025	Spring 2026
Overall course satisfaction	95.10%	97.10%	95.50%	91.90%	92.10%
Facilitator satisfaction	97.10%	97.10%	96.60%	96.70%	93.40%
Course material satisfaction	93.10%	90.20%	90.30%	86.30%	86.70%
Satisfaction with the Learn.Dialoguex.Online Platform	97.10%	89.20%	91.50%	94.40%	90.80%
Satisfaction with the course structure	91.20%	89.20%	87.50%	78.70%	88.00%

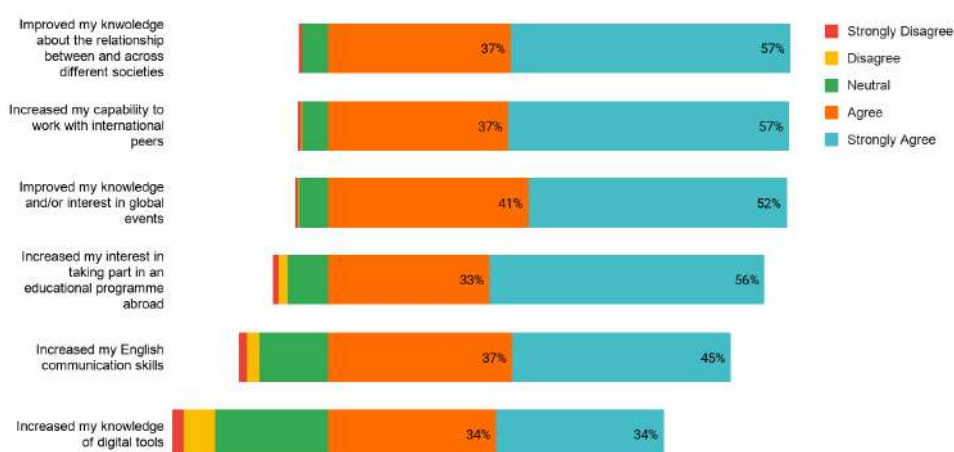
Table 2. Satisfaction rate from post-exchange survey questions across the five iterations of the project

Post-exchange survey questions

We also measured skill and knowledge improvement in participants in the post survey. These were filled out by a total of 653 participants across five iterations. There were some missing values in this set of responses, representing less than 0.25% of the responses.

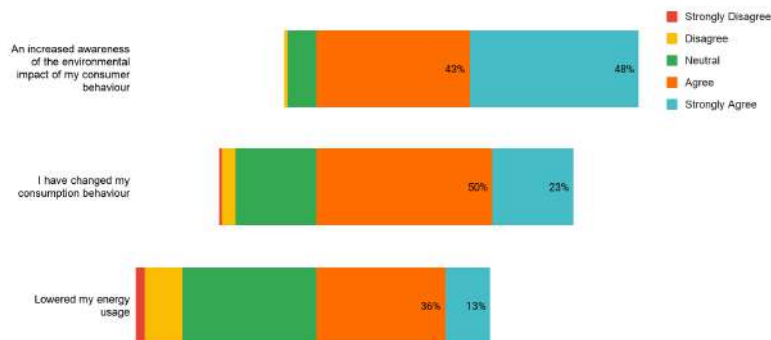
We were asked to see what percentage of the participants benefitted from participation in the programme through the acquisition of skills and knowledge, producing educational, personal or professional development. 99% of participants reported that they had indeed done so.

10. Participating in this virtual exchange has:



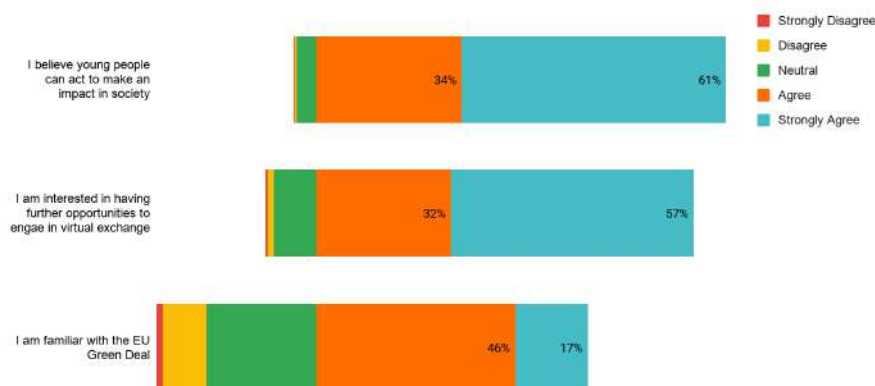
The above figure presents a breakdown of the acquired skills by the participants. As we can see they report an increase in knowledge and an increase in their collaborative skills. The majority of participants also have increased their English proficiency, and have an increased interest in taking part in an educational programme abroad. Although many still report to have increased their knowledge of digital tools, this is the weakest increase of the skill improvement set.

11. As a result of this programme I have:



We were also interested in finding out what the effect of the programme was on the energy consumption of the participants. As we can see in figure 11, participants have an increased awareness of the environmental impact of their consumer behaviour, and 73% of participants indicate that they have changed their consumer behaviour as a result of the programme. 49% of the participants also indicate that they have reduced their energy consumption.

12. How much do you agree or disagree with the following statements?



In figure 12 we see the political activation of the participants. As we can see the overwhelming majority (94%) believes that young people can make a difference in society. Most (89%) also would like further opportunities for virtual exchange, and a majority (63%) is familiar with the EU green deal.



Evaluation of sessions

Participants were also offered the opportunity to provide immediate feedback on the quality of the programme through weekly session surveys. As can be seen in Table 3 satisfaction rates were consistently extremely high, above all for the facilitators and the overall quality of the sessions.

Satisfaction	Spring 2024	Fall 2024	Spring 2025	Fall 2025	Spring 2026
Your facilitators	95%	94%	94%	94%	93%
The discussions	89%	85%	86%	82%	85%
The materials of this week	91%	87%	87%	84%	86%
The overall quality of the session	92%	89%	90%	89%	88%

Table 3. Evaluation of dialogue sessions by iteration

Participants' qualitative evaluations of CLiVEx

Feedback from participants as gathered in the post-exchange survey open questions revealed further insights on their learning through the exchange. Analysis of responses revealed that participants acquired a more nuanced understanding of climate change, shifting from an awareness of the impact on the physical environment to an appreciation of the complex and differentiated impact on people and society. This is closely tied to the concept of climate justice, a core theme of the exchange. Such a concept recognises the relationship between social justice and climate change and furthermore, that the impact or injustice is disproportionately felt across marginalised or vulnerable communities. Participants describe how their understanding developed over the course, by mentioning terms like climate justice, intersectionality, colonialism, gender and vulnerable communities.

As one participant explains:

"Yes, my understanding of sustainability and climate justice has grown and changed over time. At first, I mainly thought about the environmental side of sustainability, such as conserving resources. However, now I realize that there is also a social aspect to it. Climate



justice emphasizes how communities that are already disadvantaged are the most affected by climate change, even though they are the ones who contribute the least to it.” (Male, Palestinian)

Explaining further the issue of inequality, this participant refers to the differentiated impact of climate change:

“I am now more aware of the variety - meaning that the experience of climate change will not only differ according to geographic localisation and economic power of the country but f.e. also on socioeconomic inequality, gender inequality, racism, discrimination of indigenous and many more.” (Female, German)

Both the materials and the dialogue sessions contributed to participants’ learning - but what many participants expressed is how through dialogue and discussion the materials gained more relevance and really came to life:

“The weekly resources were vital in the process, However they would not have had the same influence if I did not have the opportunity to discuss them with other. In fact, reading them with keeping in mind that I would have the space to discuss and criticise them later during the session made me read more thoughtfully” (Female, Palestinian)

A French participant highlights how speaking in person not only enabled them to put the theory of climate change into a local context, but by empathising and putting themselves in ‘the shoes’ of a fellow student, they were able to connect emotionally to their experiences:

“I learned a lot of new information about climate injustice and got a clearer idea of how the people of the global south are living. I also think that listening to some of my fellow group members that are living in Third World countries or countries that are colonized by the global north like Palestine, talking about the conditions they're living in and the injustice they've been suffering from, contributed in changing my perspectives and understanding of climate change, because I put myself in their shoe, and felt very sad and guilty, for being able to have a safe life and not them, even though we're all human beings and deserve to have the same rights.” (French, Female)

What we found in the written responses was that where participants started from a position of uncertainty, shyness and nerves they were often able to overcome these and through the course



these concerns were replaced by positive experiences such as the confidence to speak openly and with curiosity towards their group.

Many participants had overcome initial nerves and language barriers simply to join the course. Once engaged, they found that peers' personal stories and lived experiences brought theoretical learning to life. This appreciation for diversity as a learning tool closely connects to the value of the dialogue format discussed earlier, which enables these encounters. Participants also noted gains in practical skills — such as teamwork and intercultural communication — alongside transversal skills including empathy, active listening, and global citizenship.

well..Im little nervous about meeting new people not from my country, and also since my English speaking skills are medium level or maybe less (fear of making a mistake in front of students).but to be honest, Im little comfortable since I've heard that there's no native English speakers among the students, which makes it easier to accept doing mistakes (acceptance).-> it was so fun and joyful beside the experience we gained. (Palestinian, Male)

"I was able to learn a lot from people from all around the world. It's not often you can hear directly how people are being affected by climate change and how different their living situations are in comparison to mine. I also liked that everyone in the group was open to speak about certain topics and learn together." (Male, Polish)

Besides the dialogue, the Collaborative Action Project supported participants' development of team working and collaborative skills:

"One of the most significant takeaways was the experience of collaborating with an international team and engaging in discussions on a shared topic with individuals from diverse backgrounds. This experience underscored the value of cultural diversity and varied perspectives in fostering innovation and comprehensive understanding. Working alongside team members from different countries and backgrounds provided unique insights and enriched our discussions, challenging us to consider multiple viewpoints and approaches. It was a transformative experience that highlighted the importance of effective communication, cultural sensitivity, and collaboration in achieving common goals." (Female Tunisian)

Developing their English language skills was an additional positive outcome for many of the participants for whom English may have initially appeared as a barrier, as we see in the quote below

"At first I was concerned about my English language because I'm Arabian, so I don't practice English enough, but really in the second session it was very improved." (Palestinian, female)

Evaluation of Facilitation Training

Facilitators are key to the success of CLiVEx and follow a two-step facilitation training programme developed by Soliya. These trainings were designed for professionals and those new to dialogue facilitation, sharpening key skills to facilitate and promote constructive engagement that aims at deep, authentic communication that celebrates diversity and grows from conflicts.

The Introduction to Online Dialogue Facilitation training was primarily asynchronous and focused on equipping participants with foundational skills to facilitate successfully online. The course comprised functions of dialogue and virtual exchange and key principles of facilitation. It consisted of 12-16 hours of asynchronous, paced, and interactive online learning provided through weekly learning materials, activities, and personalised feedback. Three rounds of 5-week asynchronous training were held in January and August 2024 and January 2025.

In addition, two rounds of practice-based facilitation were held, in a ten-week blended mode in Spring and Fall 2024, comprising both asynchronous and synchronous activities.

Overall, 1918 applications for training were received, 1723 were eligible participants and 1141 actually participated in training. The majority of participants were aged 18-25, and 71% were female. In terms of regional representation, the majority (74%) were from South Mediterranean countries.

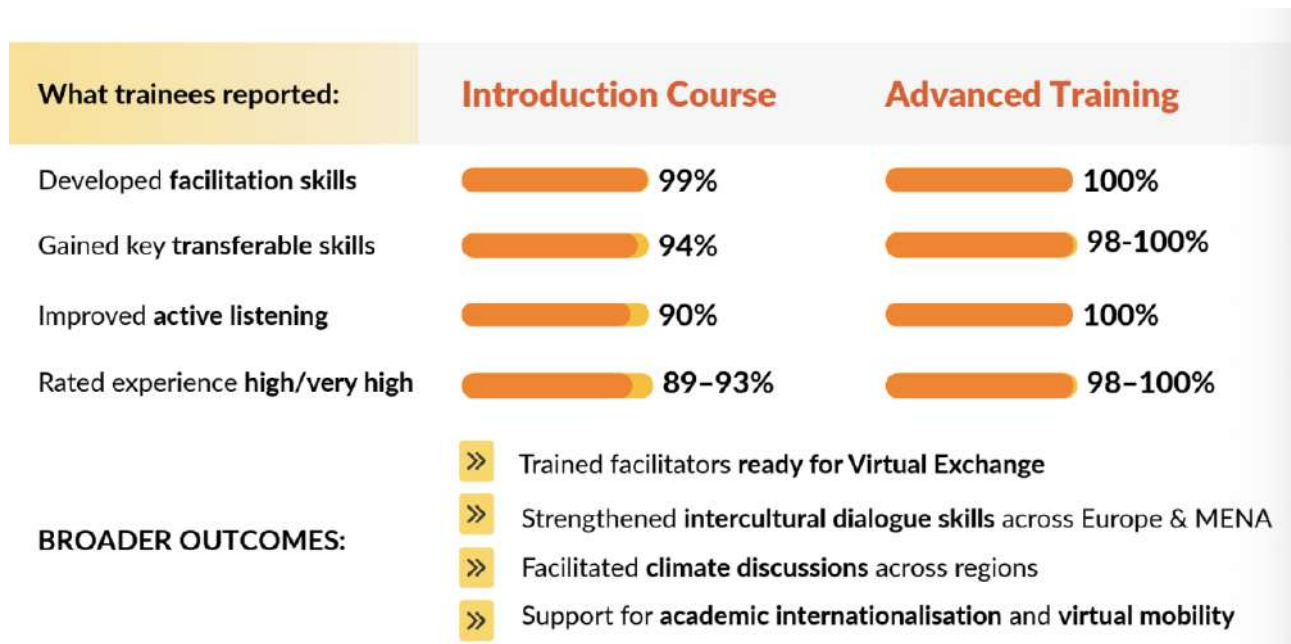


Fig. 13 Evaluation of facilitator training

To evaluate the facilitation training, a combination of post-training surveys and individualised trainer feedback on each trainee was used (see Evaluation Handbook for further information on



this). The evaluation of the training was extremely positive with 99% (Introduction Course) and 100% (Advanced Training) reporting that they developed facilitation skills, active listening (90% and 100%) and key transferable skills (94% and 98-100%). Satisfaction rates were also very high with 89-93% for the Introduction course and 98-100% for the Advanced Training.

What emerged clearly, through data on active participation, is that blended learning with synchronous sessions drives stronger engagement, retention and commitment. 76% completed Advanced Training, compared to 28% completing the fully asynchronous Introduction Course. Participant profile mattered to a certain extent, with higher completion rates among older participants and Master's/PhD level. However, as with the CLiVEx iterations, it is the strong institutional ties and integration of VE that produced both higher participation numbers and stronger retention.

Regional disparities persisted, with higher dropout rates for South Mediterranean participants compared to their European counterparts, yet it is important to highlight that this was shaped by contextual and accessibility barriers rather than motivation.

According to the feedback and self-assessment of participants, the development of the following key Facilitation skills was reported across all rounds:

- **Communication** (89-94%)
- **Empathy and active listening** (90-100%)
- **Leadership** (71-83%)
- **Intercultural dialogue** (97-98%)
- **Critical thinking** (consistently highlighted)

Facilitator trainee voices

"The learnings are not limited to the facilitation process only - they changed my complete way to communicate" (Germany, female, Advanced Training)

"I've already started unconsciously implementing the skills in my personal life. Especially in conflicts, I find myself becoming less judgemental and more willing to hear the other person's side" (Egypt, female, Advanced Training)

"I've become more self-aware. I now understand what I'm good at in terms of communicating with others, what my biases and weak points are, and how to deal with them." (Tunisia, female, Advanced Training)

"Active listening: this part kept me searching for what it really means and I kept trying to apply it any time I got the chance. It was mind blowing for me" (Tunisia, male, Introduction course)



Assessing the environmental impact of learning

Given that the theme of the exchange is climate justice, both the content and delivery needed to reflect and practise climate justice. Thus, one of the objectives of the CLiVEx virtual exchange was to understand the climate change impact of online forms of learning compared to onsite learning settings by measuring their carbon footprint through a Life Cycle Assessment (LCA). The CLiVEx VE was compared with a traditional face to face course with a number of international students.

A comparative Carbon Footprint of a Product (CFP) study of two real training courses delivered in 2023 was carried out. The aim was to measure and compare the greenhouse gas (GHG) emissions generated by the same type of educational activity in two different formats (one delivered entirely online, one in person) and to do so on a rigorous, methodologically sound basis.

Before a credible CFP study could be conducted, however, a critical prerequisite had to be addressed: the absence of adequate methodological rules for this type of service. A CFP study must be grounded in a Product Category Rule (PCR), which is a shared rulebook that specifies what is measured, how it is measured, and what counts as part of the service's life cycle. Without such a framework, two studies of the very same course could reach quite different conclusions simply because each chose to include or exclude different things. A PCR fixes this by establishing, in advance, the methodological requirements and system boundaries that any study of that product category must follow. It is the foundation on which comparable and trustworthy assessments are built, and it is issued by accredited programme operators—in this case EPD Italy—under the relevant ISO standards.

The only PCR currently in force for the education sector is PCR EPD ITALY 030 – Educational Service, issued by EPD Italy in December 2022. An in-depth review of this PCR revealed significant gaps when applied to online or hybrid learning: requirements that are impractical to fulfil for distributed online courses (such as accounting for each student's home heating or personal device use); requirements of minor relevance (such as furniture and architectural structures); and, most critically, missing requirements that are essential to any honest comparison between online and in-person delivery—above all, the energy associated with data traffic. A revised set of system boundaries was therefore developed as part of this project, with each inclusion and exclusion explicitly documented and justified. This revised PCR provided the methodological foundation on which the CFP study presented in this report was conducted.



Online	In-Person
Provider: Sharing Perspectives Foundation	Provider: University of Padua
Format: Digital learning & virtual exchange	Venue: Palazzo Bo, Padua (Italy)
Duration: 20 hours (2h/week × 10 weeks)	Duration: 42 hours (6h/week × 7 weeks)
Students: 122 · Audience: 18–35, international	Students: 110 · Mix of local & international

Table 4. Information on the two courses compared

How was it measured?

A Carbon Footprint of a Product (CFP) measures the total GHG emissions—expressed as kg of CO₂ equivalent (CO₂e)—produced across the full life of a product or service: from production of materials used, through delivery, to final disposal. This study follows ISO 14067:2018, the international standard for CFP.

The unit of comparison is: **1 hour of instruction delivered to 1 student** (1 h-student). This allows a fair, like-for-like comparison regardless of the different total durations of the two courses.

Three life cycle phases were analysed for both courses:

- Upstream: everything needed before the course runs: devices, stationery, student and staff travel, meal packaging
- Core: energy consumed while the course is being delivered: heating/cooling, lighting, electronics, and (for online) internet data transmission
- Downstream: disposal of materials used: electronic waste, stationery, packaging

Data were collected through a student questionnaire, supplemented by energy data from the University of Padova and internationally recognised life cycle databases (Ecoinvent 3.10 / SimaPro 9.6).



Key Results at a Glance

0.78

kg CO₂e per student-hour

Online Course

5.16

kg CO₂e per student-hour

In-Person Course

The in-person course emits **6.6× more CO₂e per student-hour** than the online course, which is a difference of 4.38 kg CO₂e/h per student.

Breakdown by Impact Phase

	Online Course	In-Person Course
Total Carbon Footprint	0.78 kg CO ₂ e	5.16 kg CO ₂ e
Dominant impact phase	Energy use (75%)	Transport (98%)
Main driver	Domestic heating	Air travel (88% of transport)
Transport contribution	18%	98%
Energy consumption contribution	75%	<1%
Stationery & materials	<3%	<1%
Food & beverage packaging	<4%	<1%

What causes the difference?

Online: Energy is the main issue

75% of the online course footprint comes from energy use, mostly domestic heating in students' homes. This matters because 122 students across many countries each heat their own space individually, which is less efficient than a single heated classroom. Internet data transmission (videoconferencing, servers, routers) accounts for a smaller but noteworthy share of this energy burden. Transport plays a secondary role (18%), mainly from students driving to libraries or study spaces for better connectivity—an important finding for developing countries.

In-Person: Transport as main source

98% of the in-person course footprint comes from travel. Air travel alone accounts for 88% of transport, or 87% of the total course footprint (4.44 kg CO₂e per student-hour), reflecting the international student intake of this course. By contrast, the energy needed to run the physical classroom (heating, lighting, AV equipment) contributes less than 1% of the total—a strikingly small share. Stationery, food packaging and electronic waste each contribute less than 1% in both formats.



Sensitivity analyses

Two "what if" scenarios were tested to understand how sensitive the results are to key assumptions:

Scenario	CFP (kg CO ₂ e/FU)	vs. in-person baseline	vs. online baseline
Online (baseline)	0.78	—	—
In-person (baseline)	5.16	—	+562%
In-person: –50% air travel	2.94	–43%	+277%
In-person: campus-wide energy	5.88	+14%	+654%

- Halving air travel (e.g. if the course attracted a more local student body): in-person CFP drops by 43% (to 2.94 kg CO₂e/FU) but still remains 3.8× higher than the online baseline.
- Using campus-wide energy consumption instead of single-classroom data: in-person CFP rises by 14% (to 5.88 kg CO₂e), making the gap with the online course even larger.

In all scenarios tested, the in-person course has a substantially higher climate impact than the online course. The finding is robust.

Implications

- The in-person course generates 6.6× more CO₂e per student-hour. The gap is driven almost entirely by travel, not by the energy needed to run the classroom.
- Air travel is the single largest driver for in-person courses with international audiences. Reducing the geographic catchment area or replacing one trip with online sessions would have the largest impact on reducing emissions.
- For online courses, the focus should be on domestic energy use. Encouraging students to join from well-insulated spaces or shared locations (e.g. libraries) could meaningfully reduce the footprint.
- Data traffic and IT infrastructure contribute to online course emissions and should be considered in the design of digital learning environments.
- These findings reflect the specific courses studied. Results can vary significantly depending on the geographic origin of students, transport choices, and local energy mixes. This study provides a useful reference point but should not be applied uncritically to other contexts.



- The existing Product Category Rules (PCR) for educational services (PCR EPD ITALY 030) were found to be incomplete for this type of study: they lack guidance on data traffic impacts and include mandatory items — such as building maintenance and furniture — that are difficult to quantify and of minor relevance for online delivery. A revised set of system boundaries was developed as part of this project to address these gaps, and that revised PCR served as the methodological basis for this CFP study. The proposed improvements are documented separately and could inform a future official revision of the PCR.

Methodology: CFP calculated per ISO 14067:2018, cradle-to-grave, using SimaPro 9.6 / Ecoinvent 3.10. IPCC 2021 GWP100 characterisation factors applied. Functional unit: 1 hour of instruction delivered to 1 student. Study conducted by Prospettive Sostenibili in Evoluzione with technical support from AEQUILIBRIA S.r.l. - SB. Full technical report available on request.



Conclusions and recommendations

The CLiVEX project has been a successful experience for many reasons, the most important being:

- its geographical outreach, bringing together 23 partners — both full and associated — from 20 universities across 16 countries, with all 9 South-Mediterranean countries represented.
- its impact, with 1,460 involved in Virtual Exchange activities focused on climate change, and 1,141 online dialogue facilitators trained. These figures confirm the significant role that VE can play as an innovative methodology for developing key transversal competences among young people.

It had significant impact on student learning in terms of competence and values growth in relation to sustainability and climate justice, collaborative skills, English proficiency, digital skills, and activation in terms of seeking further international and intercultural opportunities as well as making an impact on society.

At its core, CLiVEX is grounded in the fundamental principles of Virtual Exchange: fostering meaningful intercultural dialogue and mutual understanding among young people from diverse social, cultural and geopolitical backgrounds, prioritising quality over quantity, recognising the central role of facilitators, and contributing to institutional change.

This dialogue-based model of VE with large numbers of university partners is distinctive from other approaches to VE (such as teacher-led exchanges, also known as COIL, or TEPs in the context of the Erasmus+ Virtual Exchange pilot project) as reflected in the partnership. The NGOs Sharing Perspectives Foundation (SPF) and Soliya were responsible for implementing and coordinating the VEs and training of facilitators and for overseeing the quality of the exchanges and facilitation and engaging with multiple partner institutions in both European and South Mediterranean countries. This allowed for the great diversity in participants and the implementation of exchanges that achieved similar and highly successful outcomes through each iteration of the exchange.

Building on the outcomes of the CLiVEX project, the following recommendations are proposed for the future development of the programme.

Mainstream VE within institutional strategies. CLiVEX demonstrated that stronger participation and retention rates were consistently linked to deep institutional integration — where VE was embedded as an accredited module within university curricula. Future iterations should move beyond project-bound delivery and become part of multiannual internationalisation strategies at partner institutions, ensuring continuity beyond individual funding cycles.



Prioritise quality over scale. Across five iterations, the meaningful learning outcomes were observed due to student participation in well-facilitated, diverse small groups, structured dialogues sustained for 10 times 2-hours — as opposed to larger cohorts without sustained structures. Funding frameworks should therefore reward pedagogical design, facilitation quality, and measurable learning impact rather than participant numbers alone. The consistently high facilitator satisfaction scores (above 93% across all iterations) confirm that investment in facilitation training is one of the highest-impact levers available.

Broaden eligibility criteria. The project's own experience showed that the 18–30 age restriction created practical difficulties, as partner institutions could not discriminate by age within their recruited cohorts. Future programmes should open participation to wider groups, including adult learners, educators and community actors, where this serves clear educational or civic objectives.

Strengthen and scale facilitation training. The CLiVEx facilitation training reached over 1,000 trainees and produced strong outcomes, particularly in the blended format where completion reached 76% compared to just 28% in the fully asynchronous model. This evidence strongly supports the call for a European facilitator certification pathway and permanent VE support infrastructure.

Build a sustainable knowledge commons. CLiVEx produced valuable methodological innovations, including a revised Product Category Rule for Life Cycle Assessment of educational services and a diversity index for group composition. These tools risk being lost after the project ends unless mechanisms are established to share, maintain and build upon them across the wider VE community. Supporting open repositories and communities of practice would ensure that knowledge becomes cumulative rather than fragmented.

Recognise VE's environmental advantage as a strategic argument. The Life Cycle Assessment conducted within CLiVEx produced robust, ISO-compliant evidence that online delivery generates 6.6 times fewer CO₂ emissions per student-hour than in-person international education. This finding directly strengthens the case for VE as a pillar of greener internationalisation, and should be integrated into Erasmus+ sustainability reporting and evaluation frameworks.

Design blended mobility as genuine exchange. Where CLiVEx elements are incorporated into blended formats, the virtual component must be designed as a facilitated intercultural dialogue process — not reduced to preparatory webinars or online lectures. Proposals should articulate clearly how virtual and physical phases form a coherent and reciprocal learning sequence.

Diversity in partnership. CLiVEx strength lays in its diversity of partners, combining NGOs specialised in VE design, implementation and facilitation, with university partners and networks of universities. The specialisation in VE by the organisations responsible for the delivery of the Climate Justice



course and facilitation training has enhanced the quality of delivered programming. Moving forward, these specialised organisations should remain part of the VE eco system and specifically considered to offer large high quality VEs and support other organisations on facilitation, design & implementation and/or monitoring and evaluation. This could increase the overall quality of the VEs delivered.

Together, these recommendations call for a shift in how VE is positioned: not as a supplementary or emergency alternative to physical mobility, but as a distinctive, evidence-based methodology with its own transformative potential — one that is more inclusive, more sustainable, and more scalable than traditional international education.