



Report on stakeholder engagement and data collection



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Executive Summary

This report presents the findings of a **multi-method stakeholder engagement process** conducted across five European countries (Belgium, Cyprus, Italy, Romania, and Turkey) within the framework of the **Erasmus+ GreenUs project**. It synthesizes qualitative and quantitative data collected through structured interviews with educators, policymakers, NGO representatives, and institutional leaders, as well as a survey administered to university students.

The study explores how sustainability is conceptualized, implemented, and experienced in Higher Education Institutions (HEIs), focusing on curriculum design, pedagogical practices, institutional governance, and student engagement. The **interviews** reveal a shared understanding of greening the curriculum as a multidimensional and evolving process that integrates environmental, social, and economic dimensions across disciplines. Key enablers include experiential learning, interdisciplinary collaboration, institutional leadership, and community partnerships. However, challenges persist, such as curriculum rigidity, resource limitations, and uneven faculty preparedness.

Survey results complement these insights, showing that while students perceive strong institutional commitment to sustainability and visible campus practices, they report limited integration of sustainability into academic content. Disciplinary differences are significant, with students in Business and Economics showing higher engagement and awareness than those in Engineering and Technology.

The report concludes with **strategic recommendations** for embedding sustainability into HEIs, emphasizing the need for systemic change, faculty development, interdisciplinary approaches, and robust impact measurement. A phased implementation plan is proposed to guide institutions through foundational work, curriculum integration, expansion, and innovation.

Introduction and objectives

The integration of sustainability principles into higher education curricula has emerged as a critical imperative for preparing students to address complex environmental, social, and economic challenges.

This report is conducted as part of Work Package 2 of the GreenUs project, a European initiative under the Erasmus+ KA220-HED Cooperation Partnerships in Higher Education framework, and examines **stakeholder experiences and perspectives** across European contexts to identify convergent themes, divergent approaches, and strategic opportunities for advancing sustainability education. Specifically, the document offers an analysis of the data collected in relation to Objective 2, offering insights from key stakeholders – including educators, and policymakers, and students – collected through **interviews** and a structured **survey**, ensuring that the project remains grounded in real-world experiences and needs.

This report is structured as follows: following this *Introduction*, the *Methodology* section outlines the participants, the tools and the procedures followed to collect the stakeholders' perspectives. The core of the report is divided into two main empirical sections: the *Interview results*, which explore conceptual frameworks, enablers, challenges, and strategic recommendations; and the *Survey results*, which analyze HEIs student perceptions across four sustainability dimensions. A *Comparative discussion* follows, linking qualitative and

quantitative findings to highlight convergences and disciplinary differences. The final section synthesizes implications for curriculum design, institutional leadership, and student engagement, concluding with recommendations for a transformative approach to sustainability education, grounded in interdisciplinary collaboration, faculty empowerment, and institutional commitment.

By offering an in-depth analysis of what good practices are – or could be – with regard to the integration of sustainability in higher education, this report aims to identify key examples of the integration of sustainability in university education (content, methods, environments), a list of key competences for the green transition in educational contexts, a list of obstacles, favourable conditions and effective governance models for these purposes, as well as a deeper understanding of how sustainability is perceived and experienced by students.

The findings presented here lay the groundwork for subsequent phases of analysis and stakeholder engagement within the project.

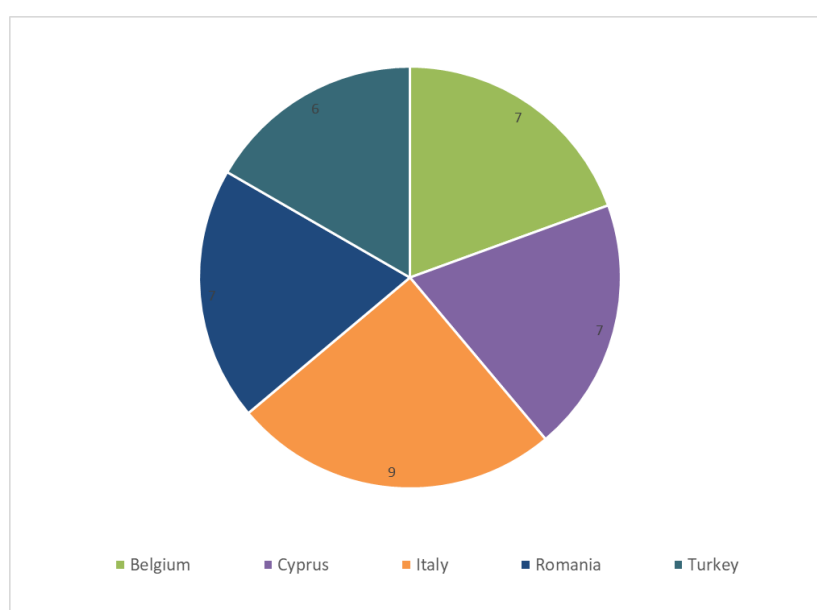
Methodology

Participants

Overall, the study involved **274 participants**: 36 professionals who took part in the interviews and 238 university students who completed the survey.

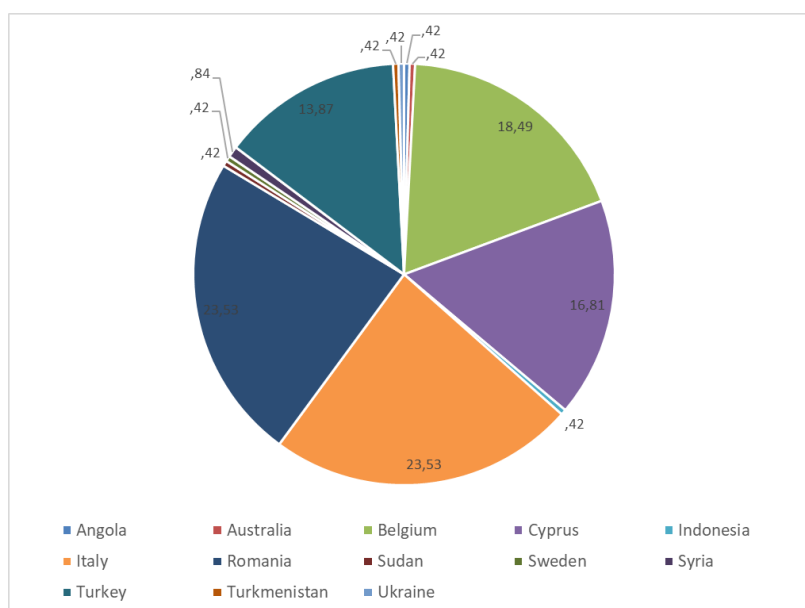
Of the **36 professionals** who took part in the **interviews**, 71.4% are female and the mean age is 41.2 ± 9.3 years. About two thirds of them (66.7%) are faculty members and/or university administrators, while the remaining part of the sample includes policy makers, experts in sustainability and training, representatives of NGOs and of civil societies associations. Participants were selected to represent different disciplinary backgrounds, institutional types, and geographic contexts across Belgium, Cyprus, Italy, Romania, and Turkey. Figure 1 shows the distribution by nationality of the respondents.

Figure 1
Distribution by nationality of the interviews sample



Of the **238 students** who completed the survey, 53.8% are female, and the mean age is 24.2 ± 7.9 years. The majority of participants (84.5%) are currently enrolled in a Bachelor's or Undergraduate program; a smaller portion (11.1%) are pursuing a Master's degree, while 4.4% are engaged in Doctoral studies (PhD or equivalent). Concerning the field of study, participants are distributed across different academic fields: Arts and Humanities (5.7%), Business and Economics (26.0%), Education (3.0%), Engineering and Technology (22.0%), Health and Medicine (1.1%), Management (33.8%), and Social Sciences (8.4%). Figure 2 shows the distribution by nationality of the respondents: the highest proportions come from Italy and Romania, each representing 23.5% of the total sample. Belgium accounts for 18.5%, while Cyprus contributes 16.8%, and Turkey makes up 13.87%.

Figure 2
Distribution by nationality of the survey sample



Tools

The study was informed by the greening strategies proposed by UNESCO (2024) and by the results of the systematic review completed as the first step of the GreenUs project (reference).

The items of the interview and the questionnaire were, whenever possible, based on validated instruments or on tools already used in previous scientific studies (Azhar et al. 2022; Aleixo et al. 2017; Aljerf & Choukaife 2016; Beringer et al. 2008; Chen et al. 2025; Dagiliūtė et al. 2018; Steg & Vlek 2009). Where necessary, however, these items were adapted to shift the focus from general sustainability to greening the curriculum specifically or additional structured items were designed to investigate dimensions not specifically captured by existing instruments.

For the **interviews**, in addition to some general socio-demographic items (sex, age, affiliation, role, years of experience with sustainability/environmental topics), two categories of questions were developed: (i) general questions applicable to all participants, exploring broader dimensions related to sustainability, outreach and service, and innovative tools and impact; and (ii) specific questions concerning curricula, faculty and staff development, and administration, mission and planning, designed exclusively for participants working in HEIs.

Table 1 shows the all the sections and items of the questionnaire and the category they belong to.

Table 1
Sections and items of the interview

Section	Items
S1 Definition and Key factors of a greening curriculum <i>[for all respondents]</i>	1 What is your definition of a greening curriculum?
	2 In your opinion, what key factors influence the development of a greening curriculum?
	3 From these factors which is the most important factor? And why is that
S2 Curriculum <i>[for HEIs respondents only]</i>	4 Indicate the extent to which your institution offers courses which address topics related to sustainability [from 1=none to 4=a great deal]
	5 Please list any courses you are aware of in which such topics are taught
	6 Please indicate which departments or programs are responsible for the most sustainability-focused courses
	7 What courses do you regard as essential that are not being taught?
S3 Faculty and Staff development <i>[for HEIs respondents only]</i>	8 Are undergraduates required to take a course on issues related to the environment or sustainability? If yes, please describe
	9 To what extent does your institution provide significant faculty and staff development opportunities to enhance understanding, teaching and research in sustainability? [from 1=none to 4=a great deal]
	10 Please describe recent faculty or staff development opportunities in these areas
S4 Outreach and Service <i>[for all respondents]</i>	11 To what extent is your institution involved in sustainable development work through formal partnerships or relationships at regional, national or international levels? [from 1=none to 4=a great deal] Please describe
	12 What local sustainability-related programs - such as internships, curriculum-integrated service-learning, or community engagement initiatives - exist at your institution or within your policy framework, and how are they supported or recognized by educational policy or institutional strategies?
	13 Does your institution participate in international programs or projects to promote sustainability in teaching and learning? Can you provide us some examples?
	14 Does your institution collaborate with external stakeholders in the provision of teaching and learning in sustainability topics? How they collaborate and how this collaboration started?
S5 Innovative tools and Impact <i>[for all respondents]</i>	15 Does your institution integrate or promote any specific innovative tools to support environmental sustainability in teaching and learning? If so, could you describe which of these tools are widely used in practice by faculty and students?
	16 Do you measure in any way the impact of the greening practices implemented in your institution? Do you use specific metrics, data sources, or assessment methods?
S6 Administration, Mission and Planning	17 Are there any entities or professional figures within your institution created to promote greening practices in teaching

Section	Items
<i>[for HEIs respondents only]</i>	and learning? If so, how have they contributed to promoting a culture of environmental sustainability?
	18 What factors have been most critical for integrating sustainability into the curriculum? Could you point to any specific policies, administrative support, or cultural shifts that have enabled this integration?
	19 What 'next steps' are planned at your institution to strengthen your commitment to greening the curriculum?

For the **students' survey**, besides questions on socio-demographic and academic data (sex, age, nationality, level of study, current university, field of study), the following categories were explored: campus sustainability, university's role in sustainable development, green curriculum, and student attitudes and perceptions towards sustainability. Table 2 provides the items used for the students' survey. Responses typically range from 1="strongly disagree" to 4="strongly agree", with the possibility of a 0="I don't know" option. Any variations in response format are specified in the Table.

Table 2
Sections and items of the survey

Sections	Items
S1 Campus sustainability	1 The university has active environmental student organizations
	2 The university encourages the use of public transport and bicycles
	3 There is a possibility to recycle waste at the university
	4 There is a possibility to use one's own non-disposable cup for coffee
S2 University's role in sustainable development	5 The university contributes to energy and resource saving
	6 The university contributes to social well-being, tolerance, fulfilment of the needs of the disabled, and social activities
	7 The university contributes to environmental education, ecology, and environmental activities
	8 The university contributes to the inclusion of sustainability aspects in study programs
S3 Green curriculum	9 The university promotes sustainability research
	10 Are undergraduates required to take a course on issues related to the environment or sustainability? <i>[no, yes]</i>
	11 Indicate the extent to which your programme of study offers courses that address topics related to sustainability <i>[from 1="none" to 4="a great deal"]</i>
	12 What courses do you regard as essential that are not being taught? <i>[open response]</i>
	13 Indicate the extent to which sustainability is integrated into the traditional disciplines of your course of study <i>[from 1="none" to 4="a great deal"]</i>
	14 Which of the following does your institution attempt to teach students? (Select all that apply)
	<input type="checkbox"/> <i>How the campus functions in the ecosystem</i> <input type="checkbox"/> <i>A sense of place: the natural features, biota, history, and culture of the region</i> <input type="checkbox"/> <i>The institution's contribution to a sustainable economy and local communities</i> <input type="checkbox"/> <i>How the institution views and treats its employees</i>

Sections	Items
	□ <i>The basic values and core assumptions that shape the content and methods of academic disciplines</i>
S4 Student attitudes and perceptions towards sustainability	15 When deciding to come to this university, I was influenced by its sustainability programs and initiatives
	16 I know how to properly dispose of my waste and recyclables on campus
	17 I can personally influence sustainability on campus
	18 I am aware of the sustainability resources around my community
	19 I am aware of various sustainability initiatives on campus
	20 The university promotes my engagement in sustainability efforts on campus
	21 I am involved in leadership activities and/or student organizations involving sustainability

Procedures

A first version of each instrument (interview, survey) was developed in English, and subsequently translations were provided in the local languages by the Partners' countries. The research protocol and the procedures for data management and protection were approved by IUSTO's Ethics Board (protocol n. 20250609-05-014-CC).

For the interviews, participants were selected by each Partner to reflect a variety of disciplinary fields and institutional categories, and were contacted personally. Most interviews were conducted either in person or via synchronous video calls, then transcribed and translated into English. In cases where this procedure was not possible, the interview questions were sent by email and completed by the respondents. The interview responses were analysed using thematic analysis, following the systematic approach outlined by Braun and Clarke (2006). This method involves identifying, analyzing, and reporting patterns (themes) within qualitative data, making it particularly well-suited for understanding shared meanings and experiences across diverse contexts. This interpretive approach allowed for both identification of shared patterns across countries and recognition of contextual variations in implementation approaches (Guest et al. 2012).

For the questionnaire, an online version was created and hosted on the Microsoft Forms platform. Participation was anonymous. The questionnaire was made available in all of the Partners' languages, and then distributed to HEIs students through the partners' mailing lists and social media channels.

Interview results

This section is organized into five main parts: the first one presents the conceptual framework stakeholders use to understand greening curricula; the second identifies critical success factors for implementation; the third part provides comparative analysis across countries highlighting areas of convergence and divergence; the fourth examines institutional perspectives with specific insights from faculty members; and the fifth one offers strategic recommendations based on the synthesis of findings. Each part integrates evidence from all five countries while maintaining attention to contextual variations.

Conceptual framework: understanding greening curriculum

Across all participating countries, stakeholders demonstrate definitional consensus and sophisticated conceptualization of greening curricula that transcends traditional environmental education boundaries.

The concept of a green curriculum emerges from the interviews as a **multidimensional** and **evolving** construct. It is not limited to environmental education but encompasses a broader transformation of **educational content**, **pedagogy**, and **institutional mission**. As noted by a Belgian researcher: “A greening curriculum means embedding environmental awareness and sustainable thinking into every subject, not just treating it as a separate topic”.

Respondents from Cyprus and Romania further highlighted the importance of **connecting global challenges with local realities**, using culturally relevant pedagogies and community-based projects. The curriculum is seen as a living framework that evolves through dialogue among educators, students, and stakeholders, aiming to cultivate a sense of planetary responsibility and agency among learners.

The predominant understanding of encompasses:

- **Interdisciplinary and experiential learning:** The interviews reveal that effective greening transcends disciplinary boundaries. Sustainability principles should be embedded across multiple disciplines rather than confined to standalone environmental courses. An Italian researcher emphasized that “a sustainable curriculum must necessarily include at least one cross-disciplinary course on these themes, linked to the 2030 Agenda” and should incorporate “approaches such as learning by doing and the teaching of transversal skills”. Hands-on experiences such as fieldwork, internships, service-learning projects, and partnerships with local organizations, enable students to apply systems thinking and interdisciplinary knowledge in concrete contexts, reinforcing learning outcomes while fostering innovation, problem-solving, and reflective practice.
- **Holistic sustainability approach:** Stakeholders consistently emphasize the three pillars of sustainability: environmental, economic, and social dimensions. True sustainability education goes beyond ecological awareness to include social equity, cultural sensitivity, and economic feasibility, equipping students with a holistic understanding of the factors shaping sustainable development. An anthropologist from Cyprus noted the importance of “integration of social justice, equity, and community perspectives”, while an Italian researcher stressed that sustainability training should cover “the three main pillars of sustainability – environmental, economic, and social – since they are closely connected”.
- **Competencies and system thinking:** The framework includes developing specific competencies for sustainable living and professional practice, with an emphasis on understanding interconnections and complex relationships within sustainability challenges. A Romanian ministry representative defined greening as “embedding environmental education and sustainable development principles into teaching across levels and subjects” to “promote eco-social skills and responsible citizenship”.
- **Action-oriented learning and civic engagement:** Multiple interviews emphasize moving beyond theoretical knowledge to practical application. A Belgian lecturer highlighted the importance of “attitude formation and involvement of students”, while a Romanian NGO representative stressed that “greening is actional, related to changing students’ behaviors and actively involve them in solving real problems”. This dimension emphasizes that sustainability education is not only about knowledge acquisition but also about shaping values and behaviors.

As articulated by a Belgian researcher: “*Sustainability should be part of the DNA of the curriculum, something that runs through the learning outcomes, the examples we use in class, and even the way we approach teaching and assessment*”, reflecting the systemic integration approach favoured by participants.

Implementation enablers: critical success factors

The identified enablers – as well as the implementation challenges and barriers that will be described in the next section – have been systematically classified under the following six categories: *Content, methods and environments*; *Key competencies*; *Governance models*; *Collaborations*; *Innovative tools*; *Impact measurement*.

Content, methods, and environments

Content-wise, many institutions have begun integrating sustainability topics into existing courses, particularly in fields such as environmental science, economics, and engineering. A Turkish academic mentioned the introduction of “*courses on circular economy and sustainable design*” as a step forward.

However, **methods** and **environments** are the elements that appear as most game-changing. Methodologically, experiential learning approaches such as service-learning, fieldwork, and living labs were frequently cited. A Belgian respondent described how “*students engage with local communities to co-create solutions to environmental problems*”, highlighting the pedagogical shift towards action-oriented learning. The learning environment also plays a crucial role, with green campuses and sustainable infrastructure serving as living laboratories.

These are the enablers related to this category that have been more consistently identified across the interviews:

- **Experiential and applied learning:** The most frequently cited enabler is hands-on, experiential learning approaches. An Italian professor emphasized that “*the approach – the experiential, action-learning process – is the most important, because it puts students in real situations and breaks down disciplinary silos*”. Multiple institutions report success with living labs, campus-based green projects, and community engagement initiatives.
- **Real-world case studies:** The integration of local and concrete examples proves essential. A Belgian municipal representative stressed using “*city climate actions and datasets in assignments: heat mapping, water plans, tree canopy and de-paving, circular procurement pilots*”.
- **Campus as living laboratory:** Several institutions successfully use their campuses as learning environments. An Italian Environment Park representative described comprehensive campus sustainability initiatives including energy monitoring, green infrastructure, and student engagement in sustainability projects.

The interviews also reveal that effective greening transcends disciplinary boundaries. **Interdisciplinary collaboration** was highlighted as an essential enabler under this category. Breaking down departmental silos and creating opportunities for cross-disciplinary course development enable students to integrate technical, social, and ethical dimensions of

sustainability. HEIs that support team-teaching and interdisciplinary curriculum design promote systems thinking and prepare students for the complexity of sustainability challenges.

To achieve this, **faculty members require support** to integrate sustainability principles across existing courses rather than treating them as standalone topics. Integrative approaches, such as embedding sustainability case studies, ethical dilemmas, and systems-thinking exercises within core disciplinary content, help students understand the relevance of sustainability to their chosen fields. Effective implementation, as highlighted in the data, depends on institutional mechanisms that enable team teaching, joint assessment, and shared ownership of learning outcomes.

Key competencies

In terms of competences, the development of systems thinking, ethical reasoning, and intercultural understanding was emphasized.

- **Systems thinking:** Multiple stakeholders identify systems thinking as fundamental. The Belgian Vrijplaats founder emphasized “*systems thinking because it is overarching*” and the importance of “*connecting knowledge with each other – with nature – to one’s own actions*”.
- **Critical thinking and ethical awareness:** The development of critical analysis skills regarding sustainability challenges emerged as crucial. A Cyprus youth worker emphasized empowering “*young people to see themselves as active changemakers*” and developing “*critical thinking, empathy, and practical skills*”.
- **Cross-cultural and global competencies:** International collaboration and global perspective are consistently identified as enabling factors, particularly through Erasmus+ programs and international partnerships.

Governance models

Governance models that support sustainability through dedicated offices, strategic plans, and cross-departmental collaboration were seen as essential. For instance, an Italian university has established a Green Office that coordinates sustainability initiatives across faculties.

- **Institutional leadership commitment:** Strong institutional commitment emerges as the primary enabler. An Italian Politecnico representative noted that “*institutional support and strategic planning*” along with “*the concept of sustainable development has been included in the Polytechnic’s statute since 2012*” are fundamental. Effective transformation requires leadership endorsement and **strategic vision alignment** at the highest institutional levels. Senior leadership (rectors, deans, and boards) must embed sustainability within the university’s mission, strategic objectives, and operations. Several successful institutions have created governance structures such as sustainability committees or vice-rectoral positions to ensure continuity and accountability.
- **Top-down policy integration:** A Turkish computer education professor observed that change “*usually works top-down for us*” and emphasized that “*the university needs to make this its own policy and disseminate this policy to sub-units*”. Policy frameworks should articulate sustainability as a core institutional value, define measurable indicators, and establish mechanisms for monitoring progress. **Resource allocation decisions** must reflect these priorities, with dedicated funding for faculty development,

sustainability research, and infrastructure improvements. Institutions must recognize and reward this innovation work to maintain long-term engagement.

- **Cross-functional coordination:** Successful institutions establish coordinating bodies. A Cyprus university representative described sustainability committees and coordinators that “*promote greening practices by developing sustainability-related policies and action plans*”. **Faculty development** and **capacity building** also play a crucial governance role. Sustained investment in professional development programs focused on sustainability pedagogy enables faculty to design interdisciplinary learning experiences and apply systems thinking approaches.

Collaborations

Collaborations at local, national, and international levels were also considered vital. Erasmus+ projects, partnerships with NGOs, and municipal collaborations were mentioned as key drivers.

- **Local partnerships:** Strong local partnerships with municipalities, NGOs, and businesses are consistently identified as enablers. A Belgian UCLL researcher described extensive collaboration with “*regional organizations where we collaborate on finding practical, sustainable solutions*”. The interviews further indicate that community partnerships should be structured as **reciprocal relationships** in which local actors are recognized as co-educators, not just sites for student projects. Formal agreements, ethical protocols, and sustained relationship-building ensure mutual benefit and long-term impact.
- **International networks:** Participation in international networks and projects proves crucial. Multiple institutions report benefits from Erasmus+ projects, European university alliances, and international sustainability networks.
- **Community engagement:** Direct community involvement in learning processes is highlighted as particularly effective. A Romanian NGO described successful “*service-learning projects*” where “*students worked with our technicians*” on practical sustainability initiatives.

Innovative tools

Innovative tools such as digital platforms, simulation software, and participatory mapping were used to enhance learning and engagement.

- **Digital platforms and simulation tools:** Several institutions report success with digital learning environments, simulation software, and online resources. The Italian institutions describe using “*digital platforms and e-learning tools that integrate sustainability modules across disciplines*”. Digital tools allow students to explore scenario planning and environmental data visualization.
- **Green labs and living labs:** Physical spaces for experiential learning prove valuable. The Belgian UCLL examples include “*mobile PV installation*” and “*mobile air-quality monitoring devices*” that serve both educational and community outreach functions.

Impact measurement

Finally, measuring the impact of educational greening practices was recognized as important, with some institutions conducting surveys, sustainability audits, and carbon footprint assessments to track progress.

- **Multi-modal assessment:** Successful institutions employ diverse measurement approaches combining quantitative metrics (energy consumption, waste reduction) with qualitative indicators (student attitudes, learning outcomes). The Italian Environment Park uses comprehensive monitoring with “*KPIs of an energy-environmental nature*” alongside “*indicators linked to maintaining comfort in buildings*”.

Implementation challenges and barriers

Despite the progress, several challenges hinder the implementation of green curricula. As the previous section on implementation enablers and critical success factors, this section classifies implementation challenges and barriers according to the following six categories: *Content, methods and environments*; *Key competencies*; *Governance models*; *Collaborations*; *Innovative tools*; *Impact measurement*.

Content, methods, and environments

Content-wise, sustainability is often treated as an add-on rather than integrated across disciplines. This reflects faculty feedback that sustainability content remains concentrated in certain departments, with limited penetration into the broader curriculum. Gaps persist particularly in circular economy, cultural perspectives (e.g., anthropology of the Anthropocene), and creative research methods for sustainability. A Cypriot educator lamented that “*in many faculties, sustainability is still seen as irrelevant or secondary*”.

Also, **methodological** challenges include limited faculty training in innovative pedagogies and resistance to change.

These are the main transversal challenges that emerge from the interviews:

- **Curriculum rigidity:** A significant challenge is the inflexibility of existing curricula and accreditation requirements. A Romanian ASE representative noted that “*the national accreditation body is not very flexible*” and this creates constraints on curriculum innovation.
- **Resource limitations:** Multiple stakeholders cite limited financial and human resources as major barriers. A Turkish professor observed that “*resources at a university will always be limited*” and this constrains implementation possibilities.
- **Assessment challenges:** Traditional assessment methods conflict with sustainability education goals. A Romanian respondent noted that “*we do not consider these learning outcomes when we do the exams*” and students may perceive sustainability-focused courses as “easy” if they don’t involve traditional testing.

Key competencies

In terms of competences, there is a gap in assessing transversal skills such as **critical thinking** and **civic engagement**. Academic respondents also highlight the absence of systematic training in **climate literacy** and **systems thinking** as key obstacles to competency development. According to the interviews, this is mainly due to:

- **Faculty preparedness:** A consistent challenge is the lack of faculty preparation in sustainability topics. A Belgian researcher emphasized that *“without teachers who feel confident and inspired to bring sustainability into their subjects, the curriculum remains a paper exercise”*.
- **Student resistance:** Some interviews reveal student resistance to sustainability content, particularly when it is perceived as additional burden rather than integral to their field of study.

Governance models

The institutional analysis confirms that progress is frequently driven by **individual initiatives** rather than institutionalized structures. Dependence on project-based funding further limits continuity.

Also, governance models often lack clarity and coordination, with sustainability responsibilities dispersed across departments. One major issue is the **fragmentation** of efforts and the lack of a coherent institutional strategy. As a Romanian policy-maker observed, *“many initiatives are isolated and depend on individual enthusiasm rather than systemic support”*.

The lack of **resources and infrastructure**, particularly in underfunded institutions, further complicates implementation.

These are the main challenges related to governance models that emerge from the interviews:

- **Lack of institutional structures:** Many institutions lack dedicated sustainability governance structures. A Turkish computer education professor noted the absence of a “sustainability office” or dedicated personnel, stating *“there isn’t”* such authority or *“at least not visible”*.
- **Policy inconsistency:** The disconnect between institutional policies and actual implementation practices creates barriers. A Romanian lecturer described this as the difference between *“the shape and the content”* where institutional support does exist but implementation risks to remain inconsistent.

Collaborations

Collaborations with external stakeholders are sometimes ad hoc and lack formal structures. Differences across national contexts also influence the sustainability of collaborations: for instance, Belgium and Romania exhibit stronger top-down policy influence, while Italian and Turkish HEIs rely more on individual faculty-driven initiatives. A Turkish respondent noted that *“partnerships with NGOs are often project-based and do not lead to long-term institutional change”*. These are the main challenges related to collaborations that emerge from the interviews:

- **Coordination difficulties:** Managing multiple partnerships and collaborations proves challenging. A Belgian respondent noted the need to “*commit to even closer cooperation with cities, municipalities and other universities*” to reduce pressure on stakeholders from independent initiatives.
- **Unequal partnerships:** Power imbalances in partnerships, particularly between universities and community organizations, can also limit effectiveness.

Innovative tools

The use of innovative tools is uneven, with some educators unaware of available technologies or lacking the skills to use them effectively. Also, some institutions with dedicated digital infrastructure or open-access resources demonstrate clear advantages, while others lack both funding and technical support. These are the main challenges related to innovative tools that emerge from the interviews:

- **Technology access and training:** Limited access to technology and inadequate training in innovative tools creates barriers. A Turkish professor admitted not having used many digital sustainability tools, noting “*I haven't used them, to be honest*”.
- **Integration challenges:** Difficulty integrating innovative tools into existing teaching practices and institutional systems is also mentioned in a number of interviews.

Impact measurement

Finally, measuring impact remains a challenge due to the absence of standardized indicators and data collection mechanisms. Institutional evidence shows that while some HEIs employ comprehensive sustainability reporting, most rely on limited, unsystematic feedback processes, highlighting the need for common frameworks. As one Belgian academic put it, “*we need better tools to understand whether our efforts are making a real difference in students' lives and in society*”. These are the main challenges related to impact measurement that emerge from the interviews:

- **Measurement gaps:** Many institutions lack systematic impact measurement. A Turkish professor noted “*this isn't being tracked*” in terms of sustainability impact indicators.
- **Long-term assessment:** Challenges in measuring long-term impacts on student behaviour and career choices after graduation are also mentioned in the interviews.

Stakeholder-specific perspectives: convergences and tensions

This section presents a closer examination of stakeholder categories, revealing distinctive perspectives and concerns that reflect their institutional positioning and operational contexts. Academics identify internal institutional barriers, civil society representatives highlight the formal-informal education divide, and policymakers recognize gaps in policy translation and evaluation.

Collectively, these accounts underscore that advancing sustainability in higher education requires coordinated action addressing structural, pedagogical, and governance dimensions simultaneously. Effective transformation must bridge the theory-practice gap identified by

academics, incorporate the community engagement expertise of civil society, and strengthen the policy implementation and evaluation mechanisms emphasized by policymakers.

Academic perspectives: the theory-practice gap

Faculty members and university administrators demonstrate strong theoretical consensus on sustainability principles, yet their accounts reveal significant fragmentation in practical implementation. Despite strategic convergence on key themes such as curricular integration, faculty development, and experiential learning, actual implementation remains highly context-dependent and uneven across institutions. The influence of local variables, particularly institutional resources and organizational culture, creates substantial variation in how sustainability education materializes in practice.

A critical tension emerges around the obligatory versus voluntary nature of sustainability integration. Some institutions have established mandatory sustainability requirements, while others rely on optional approaches, creating marked heterogeneity that risks limiting transformative impact in less-structured contexts. Academic respondents consistently identify a pronounced misalignment between the recognized criticality of faculty development and its systematic implementation. The reliance on individual initiatives, project-based funding, and international exchanges – rather than institutionalized, continuous professional development programs – represents a structural weakness. As one respondent noted, there exists an implicit expectation of high-quality sustainability education without the corresponding infrastructure for professional development. This gap reflects insufficient systematic investment in training and inadequate recognition of pedagogical innovation, pointing to the need to rebalance institutional expectations with concrete support for faculty.

NGO and civil society perspectives: bridging formal and informal education

Representatives from **NGOs and civil society organizations** highlight specific challenges related to their positioning at the intersection of formal academic structures and community-based education. Their primary concerns centre on the limited institutional integration of action-oriented learning and community engagement methodologies within formal academic frameworks. Resource constraints significantly affect their capacity to develop and sustain programs, particularly those involving participatory research and community partnerships.

A distinctive challenge for this stakeholder group involves linking formal and informal education: translating grassroots empowerment approaches and youth engagement methodologies into accredited curricular frameworks proves particularly complex. The interviews reveal tension between the flexibility and responsiveness characteristic of civil society approaches and the structural rigidity of academic accreditation systems.

Policymaker perspectives: the implementation gap

Policymakers identify a persistent implementation gap between European policy frameworks, including the Green Deal and Horizon Europe, and effective local practices. Policy translation remains inconsistent, with strong dependence on individual institutional champions rather than systematic policy compliance. This fragmented adoption pattern suggests that current policy mechanisms are insufficient to ensure widespread, coherent implementation.

Resource mobilization emerges as a critical concern: mechanisms for ensuring adequate funding reaches the implementation level remain inadequate. Policymakers also emphasize the lack of standardized frameworks for measuring sustainability learning outcomes and long-term behavioural impact across institutions. This evaluation deficit limits the capacity to assess policy effectiveness and identify best practices, hindering evidence-based policy refinement.

Discussion and strategic recommendations

Based on the insights from the interviews, several strategic recommendations can be made for implementing a green curriculum in universities.

First, there is a need to **institutionalize sustainability** by embedding it in strategic plans, governance structures, and accreditation frameworks. This includes establishing dedicated sustainability offices, creating cross-functional steering groups, and ensuring leadership commitment.

Second, curriculum reform should prioritize the integration of sustainability across all disciplines, using **interdisciplinary and experiential approaches**. Developing a core set of sustainability competences, including systems thinking, ethical reasoning, and civic engagement, is essential. Faculty development should be supported through structured training programs, peer mentoring, and recognition mechanisms.

Third, universities should foster **partnerships** with local communities, NGOs, and international networks to enhance the relevance and impact of their curricula. Innovative tools and digital platforms can support active learning and environmental monitoring.

Finally, robust mechanisms for **measuring impact** should be developed, including student surveys, sustainability audits, and longitudinal studies. As one interviewee from Cyprus concluded, *“a green curriculum is not a fixed product but a continuous process of learning, reflection, and transformation”*.

Favourable conditions to cultivate appear to be:

- strong institutional leadership commitment with clear vision and resources;
- Faculty development programs that build sustainability teaching capacity;
- international partnerships and networks that provide resources and expertise;
- community partnerships that offer authentic learning opportunities;
- recognition and incentive systems that reward sustainability teaching innovation.

In parallel, the most relevant **obstacles to address** are:

- curriculum rigidity and accreditation constraints through strategic planning and stakeholder engagement;
- resource limitations through creative funding strategies and partnership development;
- Faculty preparedness gaps through systematic professional development;
- student resistance through relevant, engaging curriculum design;
- measurement challenges through comprehensive evaluation frameworks.

Finally, according to the insights emerged from the interviews, it seems possible to formulate a proposal for the **implementation process** of a green curriculum:

Phase 1: Foundation building. The initial phase focuses on establishing the institutional groundwork necessary for long-term success. This begins with securing a clear commitment from university leadership and creating governance structures that can oversee and coordinate sustainability efforts. Institutions should conduct a comprehensive audit of existing curricula to identify where sustainability is already present and where gaps exist. This mapping exercise provides a baseline for future integration. Concurrently, faculty development programs should be launched to build capacity among educators, equipping them with the pedagogical tools and conceptual frameworks needed to teach sustainability effectively. Finally, this phase involves initiating partnerships with local communities, municipalities, and organizations, laying the foundation for community-engaged learning and collaborative curriculum design.

Phase 2: Curriculum integration. Once the foundational structures are in place, the second phase centres on embedding sustainability into the academic core. A key milestone is the implementation of a mandatory interdisciplinary sustainability course for all students, regardless of their field of study. This course should introduce systems thinking, environmental literacy, and practical problem-solving, while also connecting to students' disciplinary contexts. In parallel, sustainability components should be integrated into existing courses across departments, ensuring that the theme becomes a transversal element of the curriculum. Institutions should also begin developing living laboratory projects, using the campus as a site for experiential learning in areas such as energy monitoring, waste management, and biodiversity conservation. Community-engaged learning initiatives should be formally launched, allowing students to work on real-world sustainability challenges in collaboration with external stakeholders.

Phase 3: Expansion and refinement. With the curriculum integration underway, the third phase focuses on scaling successful initiatives and refining the educational offer. Institutions should expand the reach of sustainability education by replicating effective models across faculties and departments. This includes developing advanced, specialized courses that allow students to deepen their expertise in specific sustainability domains. International partnerships should be strengthened during this phase, leveraging networks such as Erasmus+ and Horizon Europe to exchange best practices and co-develop educational resources. A comprehensive impact measurement system should be implemented, combining quantitative indicators (such as energy use and waste reduction) with qualitative assessments (such as student learning outcomes and community feedback). This data will inform continuous improvement and demonstrate the value of sustainability education to internal and external stakeholders.

Phase 4: Sustainability and innovation. The final phase marks the transition from implementation to institutionalization and leadership. At this stage, sustainability should be fully integrated into the university's identity, operations, and academic mission. Institutions should position themselves as innovators in sustainability education, developing new pedagogical models and contributing to sector-wide advancement. Sharing best practices with other universities, participating in policy dialogues, and publishing impact reports are key activities in this phase. Universities should also explore new frontiers in sustainability, such as digital tools for environmental monitoring, interdisciplinary research on climate resilience, and student-led initiatives for social change. This phase is characterized by a commitment to ongoing learning, adaptation, and collaboration, ensuring that the green curriculum remains dynamic and responsive to emerging challenges.

This comprehensive approach requires sustained commitment, adequate resources, and collaborative engagement across all institutional levels, but the interviews demonstrate that such transformation is both necessary and achievable when approached systematically.

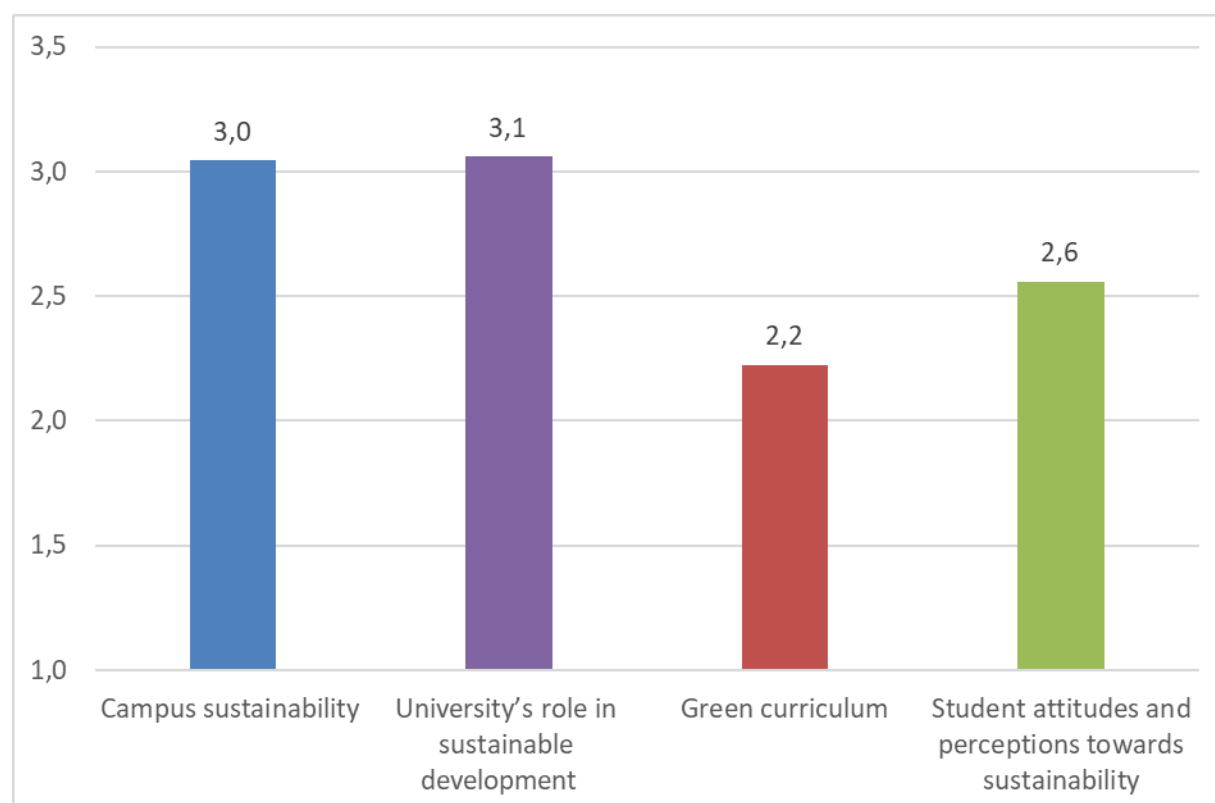
Survey results

This section presents the statistical analyses conducted on the data of the students' survey. The first part examines the extent to which students perceive that their HEI is currently engaged in core sustainability areas. The second explores associations between sustainability dimensions and selected socio-demographic characteristics of the student sample. The third focuses on the positioning of different university fields of study with respect to the investigated sustainability dimensions. The fourth investigates whether students' perceptions of sustainability-related dimensions differ significantly across academic disciplines. Finally, a discussion on the results and their possible implications is proposed.

Engagement in key sustainability areas

Figure 3 presents a comparative analysis of average scores across the four thematic categories related to sustainability in higher education of the survey. According to the data, the highest score is observed in the category *University's role in sustainable development*, which reaches an average of 3.1.

Figure 3
Key areas of university engagement in sustainability



This is closely followed by *Campus sustainability*, with an average score of 3.0, indicating a relatively strong perception of both institutional commitment and operational practices. The category *Student attitudes and perceptions towards sustainability* shows a moderate score of 2.6, suggesting a fair level of awareness and engagement among the student body. In contrast, the *Green curriculum* category records the lowest score at 2.2, highlighting a potential area for improvement in the perception of the integration of sustainability topics within academic programs.

Sustainability dimensions and student demographics

A correlation analysis revealed several statistically significant relationships between sustainability dimensions and selected socio-demographic and academic characteristics of the student sample. Below is a summary of the most relevant findings.

Level of study

Level of Study is highly negatively correlated with:

- *University's role in sustainable development* ($r = -.214$, $p < .01$)
- *Student attitudes and perceptions towards sustainability* ($r = -.242$, $p < .01$)

These results indicate that students at higher levels of study tend to report lower scores in these two sustainability dimensions.

Sustainability dimensions

Strong and highly significant positive correlations were observed among the four sustainability dimensions:

- *Campus sustainability* and *University's role in sustainable development* ($r=.59$, $p<.001$);
- *Campus sustainability* and *Green curriculum* ($r=.38$, $p<.001$);
- *Campus sustainability* and *Student attitudes and perceptions* ($r=.51$, $p<.001$);
- *University's role in sustainable development* and *Green curriculum* ($r=.34$, $p<.001$);
- *University's role in sustainable development* and *Student attitudes and perceptions* ($r=.56$, $p<.001$);
- *Green curriculum* and *Student attitudes and perceptions* ($r=.36$, $p<.001$).

These findings confirm a strong internal coherence among the sustainability dimensions, suggesting that students who score highly in one area tend to score highly in others as well.

Sustainability dimensions and field of study

The dimensions *Campus sustainability* and *Green curriculum* deal with structural and programmatic elements, i.e., what the university does and teaches. Instead, the dimensions

University's role in sustainable development and *Student attitudes* address perceptions and agency, i.e., how sustainability is understood and enacted by students. In the subsequent analyses, they have therefore been considered separately.

Campus sustainability and Green curriculum

Campus sustainability is consistently rated higher than *Green curriculum* across all disciplines, but the magnitude of the gap varies (Figure 4). Disciplines like Engineering, Health, and Management show a more pronounced difference, while Arts and Humanities and Social Sciences demonstrate a closer alignment between campus practices and curricular content.

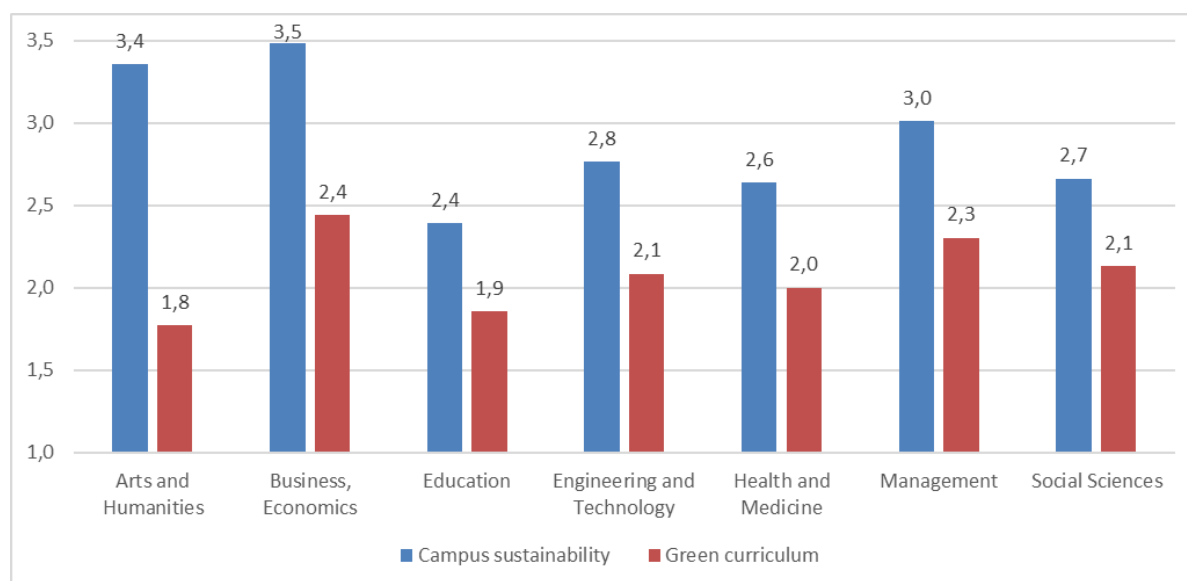
The dimension of **Campus sustainability** is perceived positively across all disciplines but shows notable variation across different fields of study, reflecting how students perceive their institution's environmental practices and infrastructure.

It reaches its highest levels in disciplines such as *Arts and Humanities* and *Business and Economics*, where students report very strong awareness of how sustainability is promoted on campus. In these areas, the scores are close to the maximum, suggesting that campus operations, facilities, and visible sustainability initiatives are well recognized and appreciated.

In *Engineering and Technology* and *Social Sciences*, the scores remain high, indicating a good level of awareness of institutional efforts, though slightly less pronounced than in the top-performing fields. These disciplines still reflect a positive perception of campus sustainability, possibly due to technical infrastructure or interdisciplinary exposure.

In *Education*, *Health and Medicine*, and *Management*, the scores are moderate, suggesting that while sustainability is present in campus life, it may not be as visible or emphasized. These fields might benefit from stronger integration of sustainability into campus operations or more targeted communication of existing efforts.

Figure 4
Scores across field of study for the key dimensions "Campus sustainability" and "Green curriculum"



The dimension of **Green curriculum** shows more variation across disciplines than Campus sustainability, and generally receives lower scores, indicating that students perceive sustainability to be less integrated into academic content than into campus operations.

It is most positively evaluated in *Arts and Humanities*, where the score is relatively high and close to that of Campus sustainability. This suggests that sustainability themes are more visibly embedded in the curriculum, possibly through cultural, ethical, or interdisciplinary approaches.

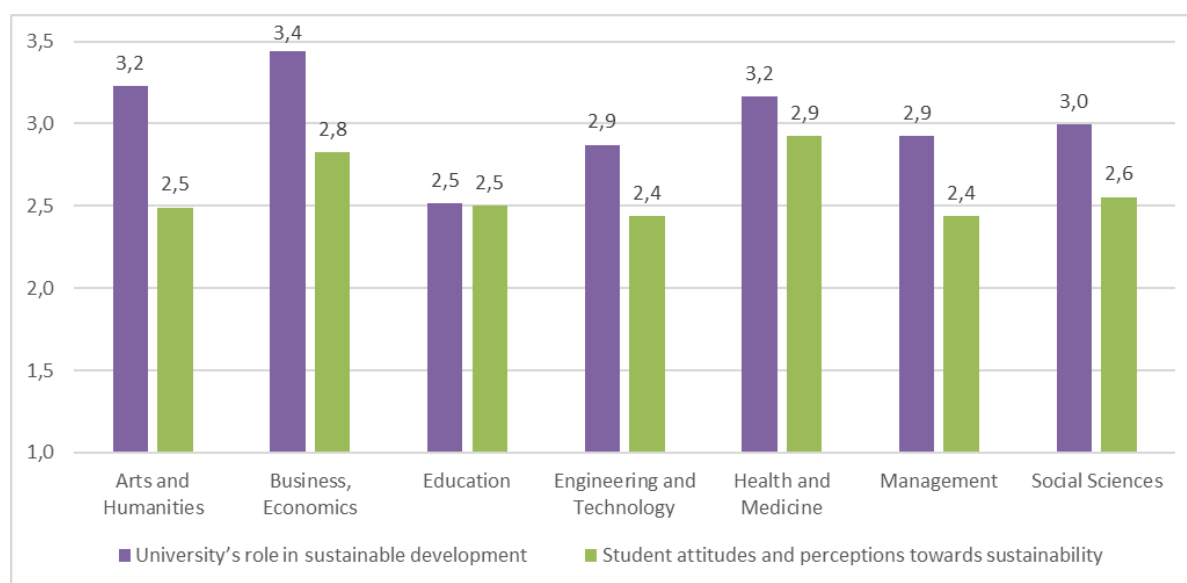
In *Business and Economics*, *Engineering and Technology*, and *Health and Medicine*, the scores are moderate, showing that while sustainability is present in the curriculum, it may not be systematically or deeply integrated. These fields may include sustainability in specific modules or elective activities, but not as a core component.

University role un sustainable development and Students attitudes and perceptions towards sustainability

Similarly, *University's role in sustainable development* is consistently rated higher than *Student attitudes and perceptions towards sustainability* across most disciplines, though the magnitude of the gap varies (Figure 5). Disciplines such as Business and Economics, Health and Medicine, and Engineering and Technology show a more pronounced difference, while Education and Social Sciences demonstrate a closer alignment between institutional responsibility and student engagement.

Figure 5

Scores across field of study for the key dimensions “University role in sustainable development” and “Student attitudes and perceptions towards sustainability”



The dimension of **University's role in sustainable development** is perceived positively across all disciplines, but with some variation. It reaches its highest levels in *Business and Economics* and *Health and Medicine*, where students report strong recognition of the institution's broader responsibilities in promoting sustainability. These scores suggest that institutional strategies and leadership are visible and appreciated in these fields.

In *Engineering and Technology* and *Arts and Humanities*, the scores remain high, indicating a good level of awareness of institutional efforts, though slightly less pronounced than in the top-performing fields. These disciplines reflect a solid perception of the university's role, possibly due to interdisciplinary exposure or ethical framing.

In *Education, Management, and Social Sciences*, the scores are moderate, suggesting that while the university's role in sustainable development is acknowledged, it may not be as strongly emphasized or communicated. These fields might benefit from clearer institutional messaging or more visible sustainability initiatives.

The dimension of **Student attitudes and perceptions towards sustainability** shows slightly lower scores across disciplines, indicating that students may not feel equally engaged or empowered in sustainability efforts. The scores are highest in *Health and Medicine* and *Business and Economics*, suggesting that students in these fields are more aligned with sustainability principles, possibly due to real-world relevance or curricular emphasis.

In *Arts and Humanities, Engineering and Technology, and Social Sciences*, the scores are moderate, reflecting a fair level of engagement but also potential gaps in awareness or participation.

In *Education and Management*, the scores are lower, pointing to a need for stronger student involvement and clearer pathways for sustainability-related action and reflection.

Disciplinary differences in perceptions of sustainability

An ANOVA was conducted to assess whether students' scores differed significantly across fields of study in relation to four key dimensions of sustainability within the university context (Table 3). For **Campus sustainability**, the results showed a statistically significant difference across disciplines ($F(6,554)=5.84$, $p<.001$), indicating meaningful variation in perceptions of campus sustainability.

Similarly, for **University's role in sustainable development**, a significant effect was observed ($F(6,465)=3.71$, $p=.002$), suggesting that students' views on the university's institutional responsibility vary by field.

In contrast, **Green curriculum** did not yield significant differences ($F(6,34) = 1.72$, $p=.119$), pointing to a relatively consistent perception of curricular integration across disciplines.

Lastly, **Student attitudes and perceptions towards sustainability** approached significance, ($F(6,343)=1.97$, $p=.073$), indicating a potential trend toward variation in personal engagement with sustainability, though not statistically conclusive.

Table 3
ANOVA results for the sustainability dimensions across field of study

Sustainability Dimension	Sum of Squares	df	Mean Square	F-value	p-value
Campus sustainability	554.48	6	92.41	5.84	<.001
University's role in sustainable development	465.94	6	77.65	3.71	.002
Green curriculum	34.37	6	5.72	1.72	.119
Student attitudes and perceptions towards sustainability	343.53	6	57.25	1.96	.073

Following the significant results obtained from the one-way ANOVA, a **post hoc multiple comparisons analysis** was conducted to identify **specific differences between academic disciplines across the four key dimensions of sustainability within the university**

context (Table 4). This analysis was necessary to determine *which* fields of study differed significantly from one another, beyond the overall group effect detected by the ANOVA.

The post hoc results for the dimensions with significant or almost significant main effects revealed several statistically significant pairwise differences:

- **Campus sustainability:** Students in *Arts and Humanities* reported significantly higher scores than those in *Social Sciences* ($p=.024$), *Engineering and Technology* ($p=.008$), and *Education* ($p=.012$). Additionally, students in *Business and Economics* scored significantly higher than those in *Social Sciences* ($p=.001$), *Engineering and Technology* ($p < .001$), and *Management* ($p = .008$). Students in *Education* also scored significantly lower than those in *Business and Economics* ($p=.001$).
- **University's role in sustainable development:** Students in *Business and Economics* scored significantly higher than those in *Social Sciences* ($p=.024$), *Engineering and Technology* ($p<.001$), *Management* ($p=.023$), and *Education* ($p=.023$). These results suggest that students in business-related disciplines perceive the university's institutional role in sustainability more positively than those in other fields.
- **Student attitudes and perceptions towards sustainability:** Students in *Engineering and Technology* scored significantly lower than those in *Business and Economics* ($p=.002$), indicating a notable gap in personal engagement with sustainability between these disciplines.

These findings highlight meaningful disciplinary differences in how sustainability is perceived and integrated within the university context, particularly in relation to campus practices, institutional responsibility, and curricular content.

Table 4
Significant pairwise comparisons for the sustainability dimensions across field of study

Sustainability Dimension	Comparison	Mean Diff.	p-value	95% CI Lower	95% CI Upper
Campus Sustainability	Arts and Humanities – Social Sciences	3.25	.024	0.43	6.08
	Arts and Humanities – Engineering & Technology	3.32	.008	0.87	5.77
	Arts and Humanities – Education	4.75	.012	1.07	8.43
	Social Sciences – Business & Economics	-3.72	.001	-5.80	-1.65
	Engineering & Technology – Business & Economics	-3.79	.000	-5.31	-2.27
	Business & Economics – Management	2.40	.008	0.63	4.16
	Business & Economics – Education	5.22	.001	2.08	8.36
University's Role in Sustainable Development	Social Sciences – Business & Economics	-2.75	.024	-5.14	-0.36
	Engineering & Technology – Business & Economics	-3.90	.000	-5.65	-2.15
	Business & Economics – Management	2.36	.023	0.33	4.39

Sustainability Dimension	Comparison	Mean Diff.	p-value	95% CI Lower	95% CI Upper
Green Curriculum	Business & Economics – Education	4.18	.023	0.57	7.80
	Management – Business & Economics	-2.36	.023	-4.39	-0.33
	Education – Business & Economics	-4.18	.023	-7.80	-0.57
	Arts and Humanities – Business & Economics	-1.12	.047	-2.23	-0.02
	Business & Economics – Arts and Humanities	1.12	.047	0.02	2.23
Student Attitudes & Perceptions	Engineering & Technology – Business & Economics	-3.38	.002	-5.44	-1.31
	Business & Economics – Engineering & Technology	3.38	.002	1.31	5.44

Discussion and implications

The findings from the student survey offer a rich and nuanced understanding of how sustainability is perceived and experienced across academic disciplines. The questionnaire, structured around four core dimensions – **Campus sustainability**, **University's role in sustainable development**, **Green curriculum**, and **Student attitudes and perceptions** – reveals consistent internal patterns, significant disciplinary differences, and important pedagogical implications.

Internal consistency and conceptual convergence

One of the most compelling results is the **strong internal correlation among the four sustainability dimensions**. For example, *Campus sustainability* is highly correlated with *University's role in sustainable development* ($r=.594, p<.001$), and with *Student attitudes and perceptions* towards sustainability ($r=.511, p<.001$). These associations suggest that students perceive sustainability as a holistic construct, where institutional practices, educational content, and personal engagement reinforce one another. This finding aligns with the literature on sustainability education, which emphasizes the systemic and interconnected nature of sustainability in learning environments (Barth & Rieckmann, 2012; Sterling, 2001). Rather than viewing sustainability as a set of isolated initiatives, students seem to recognize its embeddedness in campus culture, curriculum, and community values.

Beyond the internal correlations among the sustainability dimensions, the analysis also revealed some significant relationships with external variables. In particular, **level of study** showed a **negative correlation** with two dimensions: *University's role in sustainable development* ($r=-.214, p<.001$) and *Student attitudes and perceptions* ($r=.242, p<.001$). This suggests that students at more advanced levels (Master's, PhD) tend to perceive the university's institutional commitment to sustainability less positively and report lower levels of personal engagement. A possible explanation, consistent with the literature, is that more advanced students develop a **more critical and disenchanted view** of institutional policies, having greater experience and awareness of academic dynamics. As highlighted by Leal Filho et al. (2019), engagement with sustainability may decline if not accompanied by **concrete opportunities for participation and co-design**, particularly at postgraduate levels.

Disciplinary differences

The **ANOVA results** revealed significant differences across fields of study in two dimensions: *Campus sustainability* ($F(6,554)=5.84$, $p<.001$) and *University's role in sustainable development* ($F(6,465)=3.71$, $p=.002$). These differences were further clarified through post hoc comparisons. Students in **Business and Economics** consistently reported higher scores than those in other disciplines. For instance, they scored significantly higher than Engineering students in *University's role in sustainable development* (mean difference: 3.90, $p<.001$) and Education students (mean difference: 4.18, $p=.023$). In *Campus sustainability*, Business students outperformed Social Sciences ($p=.001$), Engineering ($p<.001$), and Management ($p=.008$). They also scored highest in *Student attitudes and perceptions* (19.17 out of 28), indicating stronger personal engagement. These results may reflect the increasing integration of sustainability-related themes, such as corporate social responsibility, ethical leadership, and sustainable innovation, into business curricula (Bebbington & Unerman, 2018). Students in these programs may be more exposed to institutional narratives and strategic frameworks that emphasize sustainability as a core value. In contrast, students in **Engineering and Technology** reported significantly lower scores, particularly in *Student attitudes* ($p=.002$ vs. Business). This is noteworthy given the technical relevance of engineering to sustainability. The gap may reflect a **disconnection between technical content and ethical-social awareness**, as highlighted by scholars advocating for transversal competencies in STEM education (Byrne et al., 2013). Students in **Arts and Humanities** and **Social Sciences** presented more nuanced profiles. Arts students scored high in *Campus sustainability* and *University's role in sustainable development*, but low in *Green curriculum*. This suggests cultural and social sensitivity, but limited curricular structure. Social Sciences students showed moderate scores across dimensions, with relatively low *Green curriculum* integration and *Campus sustainability*.

The role of academic discipline

Academic discipline appears to play a significant role in shaping students' sustainability perceptions. Disciplines are not merely containers of content: they are **epistemological and cultural environments** that influence how students interpret knowledge and values. According to disciplinary epistemology theory (Becher & Trowler, 2001), each field transmits implicit assumptions about what counts as valid knowledge, which can either facilitate or hinder sustainability integration. For example, technical disciplines may prioritize problem-solving and efficiency, while humanities and social sciences emphasize critical thinking and systemic reflection. These epistemological orientations are reflected in the data: Business students seem to integrate strategic and institutional aspects of sustainability, while Engineering students show less personal awareness despite their field's relevance.

Pedagogical implications

The coherence among dimensions and the disciplinary differences suggest that sustainability is perceived as a **multidimensional concept**, but not yet fully embedded across all fields. Universities should consider **tailored pedagogical strategies** that align with the epistemological characteristics of each discipline. STEM programs may benefit from enhanced ethical and social components, while humanities programs could strengthen environmental curricular offerings.

Moreover, the lack of significant differences in **Green curriculum** ($F(6,34)=1.72$, $p=.119$) points to a **cross-disciplinary gap in sustainability integration within formal education**. This is a critical area for development, as curriculum design plays a central role in shaping student competencies and long-term engagement.

Comparison between interview and survey results

Green curriculum: perception vs. implementation

- **Survey:** *Green curriculum* is the lowest-scoring dimension, indicating a perceived limited integration of sustainability into academic content across all disciplines.
- **Interview:** Interviewed stakeholders confirm this gap, highlighting missing modules, fragmented offerings, and reliance on individual initiatives. Faculty members report the absence of interdisciplinary courses and systemic approaches such as “education for sustainable development” or “climate literacy”.

Student perceptions from the survey and HEIs experiences from the interviews converge in recognizing that sustainability remains only marginally integrated into curricula.

Institutional role and leadership

- **Survey:** The dimension *University's role in sustainable development* received the highest score, but shows significant differences across fields of study and negative correlations with level of study.
- **Interview:** Stakeholders emphasize that successful integration depends heavily on institutional leadership, the presence of dedicated governance structures, and strategic alignment with European priorities.

While students acknowledge the university's role in sustainable development, qualitative data reveal that this role is variable and context-dependent. Leadership is an enabling factor, but not always systemic or evenly distributed.

Student attitudes and engagement

- **Survey:** The dimension *Student attitudes and perceptions towards sustainability* shows moderate scores and negative correlations with level of study, suggesting a decline in engagement among more advanced students.
- **Interview:** Stakeholders (especially activists and NGOs) stress the importance of fostering engagement but also point to systemic barriers such as academic workload, lack of awareness, and limited opportunities. Student engagement is recognized as crucial, but it is affected by structural and motivational factors. Data suggest that engagement must be nurtured through concrete experiences and active citizenship pathways.

Campus sustainability and visible practices

- **Survey:** *Campus sustainability* scores relatively high (68%), with significant differences across disciplines (e.g., Business vs. Engineering).
- **Interview:** Campus practices (e.g., living labs, environmental monitoring projects, technology reuse) are cited as innovative pedagogical tools, but their implementation is uneven and often tied to external projects.

Visible sustainability practices influence student perceptions, but the qualitative report highlights that not all universities adopt them systematically, and evaluation tools and continuity are often lacking.

Disciplinary differences and epistemologies

- **Survey:** Differences across disciplines are significant in all dimensions except *Green curriculum*. Business and Economics students score higher, while Engineering students score lower.
- **Interview:** Interviews reveal that disciplines offer distinctive but differentiated contributions. For example, social sciences emphasize justice and participation, engineering focuses on technical innovation, and humanities on cultural narratives and critical thinking.

Disciplinary differences are not only quantitative but reflect broader epistemological worldviews. This confirms the need for differentiated pedagogical strategies, as suggested in both reports.

Faculty development

- **Survey:** Not directly measured, but implicitly reflected in the *Green curriculum* dimension.
- **Interview:** It is the most frequently cited enabling factor, yet also the most lacking. Faculty report a lack of systematic training, reliance on externally funded projects, and absence of incentives. The weakness of the *Green curriculum* in the quantitative data is explained by the qualitative findings, which show that without training and support for faculty, curricular integration remains fragmented.

Conclusion

This report highlights the multifaceted nature of sustainability integration in higher education, revealing both promising developments and persistent challenges across institutional and disciplinary contexts. Through a combination of stakeholder interviews and student survey data, the study offers a comprehensive view of how sustainability is conceptualized, implemented, and experienced within European universities.

Findings from the interviews underscore a shared understanding of sustainability as a transformative educational principle, one that requires interdisciplinary collaboration,

experiential learning, and institutional commitment. However, implementation remains uneven, often driven by individual initiative rather than systemic strategy. Faculty development, governance structures, and resource allocation emerge as critical levers for change, yet they are inconsistently supported across institutions.

Survey results complement these insights by exposing a gap between visible campus sustainability practices and the integration of sustainability into academic curricula. Students generally perceive their universities as environmentally engaged, but report limited exposure to sustainability within their formal education. Disciplinary differences are pronounced, with students in Business and Economics showing higher engagement and awareness than those in Engineering and Technology, suggesting that epistemological orientations shape how sustainability is understood and valued.

Recommendations for transformative action

1. Institutionalize sustainability as a core institutional value. This means embedding sustainability not just as an initiative or project, but as a fundamental organizational principle. Institutions must revise strategic plans to explicitly include sustainability goals, ensure governance structures actively support these goals, and integrate sustainability criteria into accreditation processes. Establishing a dedicated Office of Sustainability, supported by cross-functional steering groups, is crucial for providing oversight, coordination, and accountability. This structural commitment signals that sustainability is central to institutional identity and decision-making at all levels.

2. Transform curriculum through interdisciplinary and experiential approaches. The curriculum requires a fundamental shift beyond traditional disciplinary silos. Institutions must prioritize the development of a mandatory interdisciplinary sustainability course for all students, regardless of field of study, and systematically integrate sustainability modules into existing courses across all faculties. The goal is to develop core competencies, including systems thinking, ethical reasoning, and critical problem-solving, that are relevant to sustainability challenges across diverse professional contexts. This transformation must be discipline-sensitive, respecting epistemological differences while ensuring universal sustainability literacy.

3. Empower faculty as the linchpin of transformation. Faculty members are central to any curricular transformation, yet they remain inadequately supported. Institutions must invest strategically in building faculty capacity to teach sustainability through structured training programs, peer mentoring networks, and formal recognition of efforts in sustainability teaching and research. Building communities of practice will foster innovation in both pedagogical approaches and content development. Actionable mechanisms include providing dedicated grants for sustainability-focused course development, creating time allocations for curriculum redesign, and valuing sustainability teaching innovation in promotion and tenure decisions.

4. Foster authentic partnerships as collective endeavours. Sustainability is inherently a collective endeavour that extends beyond campus boundaries. Institutions must actively collaborate with local communities, NGOs, government bodies, and international networks. These partnerships enrich the curriculum by providing authentic learning opportunities, such as internships, service-learning projects, and community-based research, while amplifying institutional impact beyond the campus. Effective partnerships should be structured as reciprocal relationships with formal agreements, ethical protocols, and sustained engagement that benefit all stakeholders.

5. Measure impact through comprehensive evaluation frameworks. Continuous measurement of progress is essential for accountability and strategic refinement. This requires robust mechanisms including annual student surveys on sustainability literacy, comprehensive campus sustainability audits, and longitudinal studies tracking graduate career paths and long-term behavioural change. Combining quantitative metrics, such as energy consumption reductions and carbon footprint measurements, with qualitative indicators, such as shifts in campus culture and student attitudes, will provide a holistic view of impact. This data is critical not only for demonstrating accountability but also for refining strategies and identifying areas requiring additional support.

These strategic priorities are best pursued through the phased implementation roadmap outlined in this report: establishing foundations through governance structures and comprehensive curriculum auditing (Phase 1); integrating sustainability into curriculum and campus operations through mandatory courses and living laboratories (Phase 2); expanding and refining successful initiatives across faculties while strengthening international partnerships (Phase 3); and ultimately positioning the institution as an innovator and sector leader in sustainability education (Phase 4). This approach recognizes that transformation is gradual, requiring sustained commitment, adequate resources, adaptive management, and continuous stakeholder engagement.

Taken together, the convergence of qualitative and quantitative findings demonstrates that advancing sustainability in higher education requires coordinated efforts across leadership, faculty, and student bodies, supported by context-sensitive strategies that respect disciplinary diversity while fostering shared responsibility. This is not a technical challenge alone, but a cultural and organizational transformation that demands alignment of institutional values, pedagogical practices, and operational systems.

The GreenUs project contributes to this transformation by identifying strategic pathways for embedding sustainability more effectively within higher education institutions across Europe. These findings lay the groundwork for future phases of the project, which will develop practical tools, pedagogical resources, and implementation guidelines to support institutions in their sustainability journeys.

References

- Aleixo, A. M., Azeiteiro, U. M., & Leal, S. (2017). UN decade of education for sustainable development: Perceptions of higher education institution's stakeholders. *Handbook of Theory and Practice of Sustainable Development in Higher Education: Volume 4*, 417-428.
- Aljerf, L., & Choukaife, A. E. (2016). Sustainable development in Damascus University: A survey of internal stakeholder views. *Journal of Environmental Studies*, 2(2), 1-12.
- Beringer, A., Wright, T., & Malone, L. (2008). *Sustainability Assessment Questionnaire (SAQ) for Colleges and Universities*. University Leaders for a Sustainable Future (ULSF).
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77-101. <https://doi.org/10.1191/1478088706qp063oa>
- Chen, C., Shahbaz, P., & Haq, S. (2025). Transforming students' green behavior through environmental education: The impact of institutional practices and policies. *Frontiers in Psychology*, 15, 1499781. <https://doi.org/10.3389/fpsyg.2024.1499781>

Dagiliūtė, R., Liobikienė, G., & Minelgaitė, A. (2018). Sustainability at universities: Students' perceptions from Green and Non-Green universities. *Journal of Cleaner Production*, 181, 473-482.

Guest, G., MacQueen, K. M., & Namey, E. E. (2012). Planning and preparing the analysis. In *Applied Thematic Analysis* (pp. 21-48). SAGE Publications.

Syed Azhar, S. N. F., Mohammed Akib, N. A., Sibly, S., & Mohd, S. (2022). Students' attitude and perception towards sustainability: The case of Universiti Sains Malaysia. *Sustainability*, 14(7), 3925.

Steg, L., & Vlek, C. (2009). Encouraging pro-environmental behavior: The role of motivations, abilities, and opportunities. *Journal of Social Issues*, 65(1), 29-46.

Barth, M., & Rieckmann, M. (2012). Academic staff development as a catalyst for curriculum change towards education for sustainable development: An output perspective. *Journal of Cleaner Production*, 26, 28-36.

Becher, T., & Trowler, P. R. (2001). *Academic tribes and territories: Intellectual enquiry and the cultures of disciplines* (2nd ed.). Open University Press.

Bebbington, J., & Unerman, J. (2018). Achieving the United Nations Sustainable Development Goals: An enabling role for accounting research. *Accounting, Auditing & Accountability Journal*, 31(1), 2-24.

Byrne, E. P., Desha, C. J., Fitzpatrick, J. J., & Hargroves, K. (2013). Exploring sustainability themes in engineering education. *International Journal of Sustainability in Higher Education*, 14(4), 384-403.