Sulitest.org

Mainstreaming Sustainability Literacy

How to transform higher education institutions

THE ROLE OF STRATEGIC LEADERSHIP AND ACADEMIC GOVERNANCE

A White Paper produced by Sulitest, writen by Pauline Proboeuf, PhD

Executive Summary

Context and objectives

Higher education institutions are increasingly expected to integrate sustainability into teaching and prepare graduates to address complex environmental and societal challenges. While sustainability has become a strategic priority for many universities, **less is known about how these commitments are translated into concrete curriculum change**. In particular, the role of leadership and academic governance actors in accelerating sustainability integration remains underexplored.

This study examines **how sustainability moves from institutional strategy to operational implementation within academic programs**, focusing on the perspectives and actions from those responsible for curriculum design and revision, including program directors, academic leaders, and governance bodies.

Research approach

The research is based on qualitative interviews and institutional analysis conducted across multiple higher education institutions (listed in Appendix A). It explores how sustainability is negotiated within program design processes and how governance actors mediate between institutional strategy, regulatory frameworks, pedagogy, and external expectations.

Key findings

The findings show that sustainability integration occurs within a **complex governance ecosystem** rather than through linear curriculum reforms. Academic programs evolve through **periodic cycles of review and adjustment** that combine strategic decision-making, regulatory compliance, pedagogical implementation, market feedback, and evolving knowledge on sustainability.

Within this process, **governance actors play a critical mediating role**. Program directors, academic leaders, and curriculum committees **translate institutional priorities into operational teaching practices** while coordinating multiple stakeholders, including faculty, accreditation bodies, students, and industry partners.

Institutional, national, and international frameworks—such as accreditation standards and sustainability competency frameworks—strongly shape curriculum development. These frameworks provide both constraints and opportunities. Beyond ensuring compliance and legitimacy, they can also act as drivers of institutional change by providing justification for integrating sustainability into program objectives.

However, **the depth of sustainability integration depends**

largely on internal organizational conditions. Leadership commitment, faculty engagement, governance coordination, and pedagogical support emerge as critical enabling factors. Conversely, compliance-driven approaches, increased faculty workload, and difficulties translating sustainability into disciplinary teaching content often limit the scope of curriculum transformation. Many institutions also face challenges in measuring the long-term impact of sustainability education on graduate competencies and professional practices.

Implications for higher education institutions

The findings suggest that embedding sustainability in academic programs is not simply a matter of curriculum design but rather a **broader organizational transformation**. Effective integration requires alignment between institutional strategy, governance mechanisms, and pedagogical practices.

Institutions that successfully advance sustainability integration tend to treat frameworks not merely as accreditation requirements but as **strategic tools guiding curriculum development**. They also invest in **faculty training** and foster **collaboration** between leadership, program directors, and teaching staff to translate sustainability objectives into disciplinary learning outcomes.

Finally, strengthening mechanisms to **monitor curriculum integration and graduate competencies** can help institutions move beyond symbolic commitments toward **systematic and measurable sustainability education**.

Table of Contents

Introduction

Objective

This research project aims to analyze **how sustainability is translated, negotiated, and operationalized within academic programs**, focusing on the actors directly responsible for the design, revision, and maintenance of curricula: program directors and equivalent roles.

Rather than approaching sustainability as a normative or standalone educational goal, this qualitative research seeks to understand **how it interacts with existing program logics**, such as market positioning, employability, accreditation requirements, pedagogical coherence, and resource constraints.

By examining the day-to-day decision-making contexts of program directors, the research aims to **identify the conditions under which sustainability can be integrated in a lasting and systematic way into academic programs**, beyond isolated courses or symbolic commitments.

Theoretical Framework

This research sits at the intersection of institutional theory, curriculum studies, and organizational change in higher education, aiming to **analyze the integration of sustainability not as a simple pedagogical addition but as a process of institutional and curricular transformation**.

Research on the life-cycle of academic programs and their alignment with sustainability in higher education has emerged as a critical area of inquiry due to the increasing global emphasis on sustainability and the pivotal role universities play in this transition (Veidemane et al., 2025). Over the past two decades, the integration of sustainability into higher education curricula and institutional practices has evolved from isolated initiatives to more systemic approaches, reflecting broader societal and environmental challenges (Trevisan et al., 2024; Weiss et al., 2021).

This evolution is underscored by international frameworks such as the United Nations' Sustainable Development Goals (SDGs), which position higher education institutions (HEIs) as key actors in fostering sustainability literacy and transformative change (Serafini et al., 2022; Shih et al., 2025). Notably, recent studies highlight that while many higher education institutions (HEIs) recognize sustainability's importance, the depth and consistency of integration vary widely, with only a fraction achieving comprehensive institutionalization (Aghajani et al., 2025; Weiss et al., 2021).

The significance of this research is further amplified by data

indicating that sustainability competencies are essential for preparing graduates to address complex global challenges, thereby influencing workforce readiness and societal resilience (Lozano et al., 2019).

Despite growing attention, a specific problem persists in understanding **how academic programs progress through their life cycles in relation to sustainability integration and what role executive leadership and academic governance have in this process** (Acquah, 2010; Veidemane et al., 2025). Existing literature reveals a knowledge gap concerning the dynamic interplay between program development stages—introduction, growth, maturity, and decline—and the roles of academic leaders such as heads of programs, deans, and sustainability representatives in navigating sustainability transformations (Barth & Rieckmann, 2016; Leal Filho et al., 2020; Weiss, Barth, & von Wehrden, 2021). Competing perspectives emerge regarding the optimal leadership roles and strategies, with some advocating for active driving roles while others emphasize supportive or adaptive stances (Visser & Courtice, 2011; Hallinger & Suriyankietkaew, 2018; Veidemane et al., 2025). This controversy reflects broader institutional tensions, including resource constraints, competing priorities, and varying stakeholder engagement levels (Lattu & Cai, 2020; Robinson et al., 2023). The consequences of this gap are significant, as insufficient understanding hampers effective program design, sustainability embedding, and long-term institutional commitment (Blanco-Portela et al., 2017; Weiss et al., 2021).

Furthermore, **a growing body of research addresses sustainability in higher education**, notably through the lenses of student learning outcomes and competencies, faculty members engagement, institutional commitments and rankings, as well as the dissemination of best practices or exemplary initiatives (e.g., Lozano et al., 2013; Sterling, 2011; Barth & Rieckmann, 2016; Leal Filho et al., 2019; B. A. Christie et al., 2015). While these studies have largely helped legitimize sustainability as a central concern for higher education institutions, they often adopt a normative or results-oriented perspective, focusing on what should be taught or achieved, rather than how curricular change unfolds in practice. **Less attention has been paid to the organizational processes through which sustainability is translated into academic programs.** This project addresses this gap by shifting the analysis toward:

- Leadership and academic governance roles as key intermediaries between strategy, pedagogy, and operations,
- micro-level decision-making processes through which sustainability is integrated, diluted, or resisted,
- and the translation work necessary to align sustainability with dominant academic and managerial logics.

In doing so, the research aims to provide empirical and theoretical insights into **how sustainability can move from strategic intent to curricular reality**.

The conceptual framework guiding this research defines the academic program life cycle as a sequence of phases characterized by distinct challenges and opportunities for sustainability integration (Acquah, 2010). The research builds on the concept of institutional work (Lawrence & Suddaby, 2006), which highlights how actors create, maintain, or transform institutions through daily practices, negotiations, and discursive strategies. Leadership and academic governance roles are considered institutional actors who operate within a framework of strong structural constraints (accreditations, market competition, resource limitations) while retaining agency in translating strategic directions into concrete curricular choices.

Sustainability is thus analyzed as an object of legitimization work: it is understood as a multi-dimensional process encompassing curriculum, institutional policies, and stakeholder engagement, grounded in theories of organizational and transformational change (Weiss et al., 2021; Trevisan et al., 2024).

Understanding how programs are designed and reviewed

Key findings

The analysis of interviews and institutional documents reveals that academic program design and review are structured through a **multi-layered governance process** combining strategic decision-making, regulatory compliance, pedagogical implementation, market feedback, and epistemic adaptation. Rather than following a purely linear model, programs evolve through **successive cycles of negotiation and adjustment**, involving multiple actors and institutional frameworks.

The life cycle of academic programs

The design and evolution of academic programs can be understood through the framework of the Academic Program Life Cycle (APLC), which conceptualizes programs as evolving entities shaped by institutional, market, and societal dynamics. According to Acquah (2010), the APLC represents the trajectory of an academic program from its initial introduction through growth, maturity, and eventual decline or renewal. Empirically, this trajectory is often reflected in enrollment patterns: programs typically begin with an initial cohort of students, experience a period of growth, reach a peak in registrations, and eventually stabilize or decline unless revised, replaced, or withdrawn.

Within this model, academic programs typically progress through several stages—introduction, growth, maturity, and decline—although some programs may experience subsequent cycles of renewal leading to additional phases of growth and stabilization.

However, our empirical data suggest that **program transformation in higher education rarely follows a smooth and continuous trajectory**. Instead, programs evolve through punctuated phases of revision, often occurring every three to six years and in some cases extending to a decade (e.g., at the Saudi university KAUST). Major curriculum revisions remain relatively rare in many institutions (e.g., at the French institution ENPC), indicating that program evolution tends to occur through incremental adjustments rather than large-scale redesigns.

While the APLC model provides a useful analytical lens for understanding program trajectories, it tends to emphasize market-driven indicators—particularly enrollment dynamics—and may therefore oversimplify the complex socio-political, institutional, and pedagogical processes shaping program development. In particular, it does not fully capture the institutional negotiations required to integrate sustainability into curricula, which often involve deeper governance and epistemic transformations.

Governance actors and institutional structures

The design, implementation, and review of academic programs are embedded within governance structures that bring together a wide range of actors. Both strategic leadership and academic governance bodies play critical roles in shaping program trajectories.

Institutional leadership—such as deans or executive roles — typically defines strategic priorities, allocates resources, and enables institutional change. In contrast, academic governance actors — including program directors, academic directors, and faculty committees — are responsible for the operational development and oversight of curricula.

These actors interact through formal governance mechanisms such as curriculum review boards, pedagogical committees, and program advisory boards (e.g., conseils de perfectionnement in France). These bodies typically meet annually to review program performance, assess alignment with institutional goals, and consider potential revisions. Governance therefore functions as an **enabling framework**, mediating between institutional strategy and academic autonomy while integrating the constraints faced by faculty members.

Beyond these formal structures exists a broader ecosystem of stakeholders—including students, alumni, employers, accreditation bodies, and external partners—whose perspectives influence program development and review. Consequently, academic programs are shaped by a **distributed governance system** rather than a single decision-making authority.

Institutional and regulatory frameworks

Academic programs operate within **institutional and regulatory frameworks that define both constraints and opportunities for curriculum development**. Most higher education institutions are influenced by a combination of national and international standards, accreditation requirements, and quality assurance mechanisms. These frameworks typically establish expectations regarding learning outcomes, competency frameworks, assessment procedures, and program evaluation.

While such frameworks impose compliance requirements — including auditing, reporting, and evidence of learning outcomes — they can also serve as catalysts for innovation. In particular, sustainability-related frameworks increasingly provide leverage for integrating environmental and societal considerations into curricula and assessment practices. Nevertheless, these frameworks often emphasize standardized competency structures, which may limit flexibility and create tensions between institutional accountability and pedagogical experimentation.

Phases of program transformation

Our empirical data identifies five interrelated phases that structure the process through which sustainability—and other emerging priorities—is integrated into academic programs. There are of course some national differences, which we will detail.

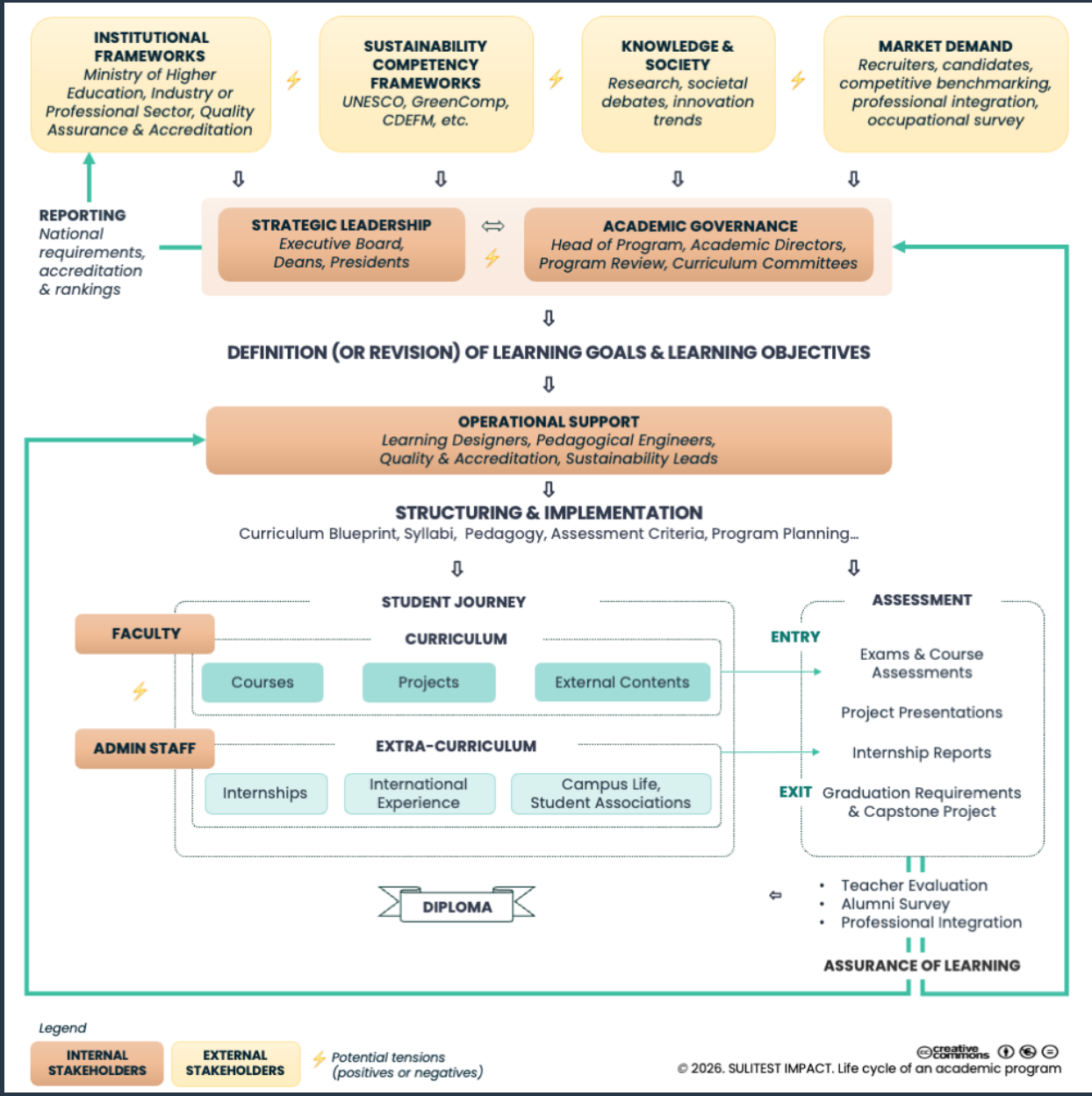

Figure 1. Life cycle of an academic program: *This diagram illustrates an academic program as a continuous, feedback-driven system shaped by both external and internal forces. External inputs inform institutional strategy and academic governance, which define learning objectives. These are translated by operational support teams, shaping both the formal curriculum and the broader student experience. Student progression is assessed through exams, projects, and graduation requirements, while outcomes data feed back into quality assurance and institutional reporting, ensuring ongoing programme improvement.*

1. Strategic decision-making phase

The strategic phase represents the moment when major program transformations are debated and validated. Decisions concerning program orientation, competency frameworks, and long-term positioning are typically derived from the institution's broader strategic project.

These strategic cycles are relatively long, often occurring every four to six years, although in some institution's redesigns may occur more frequently. In certain contexts, such as at KAUST, major revisions may occur over a ten-year horizon.

Strategic discussions often reflect broader shifts in the higher education landscape and the growing institutionalization of sustainability. As one interviewee explained:

> *"There have been quite significant changes between the 2020 strategy and the one released last year. Why is that normal? Because in the meantime the world has changed dramatically. Sustainable development and ecological transition are no longer innovative positioning. Many other schools are now working on these topics."*

This evolution illustrates how sustainability agendas increasingly shape institutional positioning. The same respondent continued:

> *"There was the Jouzel report[1], ministerial directives, all our accreditors emphasized this… EQUIS in particular. This has shifted the ecosystem, and that's very positive. So at some point, of course, we must adapt."*

Strategic governance therefore plays a crucial role in legitimizing sustainability-related transformations and embedding them within institutional priorities.

2. Normative and compliance phase

The second phase concerns the regulatory and accreditation frameworks that shape program design. No academic program can operate outside these institutional and regulatory structures, although their influence varies significantly across national contexts.

In France, higher education programs operate within a particularly structured regulatory system. Degrees must comply with national frameworks such as the RNCP, and external evaluations by accreditation bodies such as HCERES or CTI (for engineering studies) are mandatory for many programs. These frameworks define competency structures, program architecture, and quality assurance requirements.

By contrast, institutions in other national contexts often benefit from greater academic autonomy. While national quality assurance systems exist, they tend to be less prescriptive,

1 The French Minister for Research, Higher Education and Innovation, asked to Jean Jouzel to chair a working group to examine the issue of raising awareness and training all students in our higher education system in the major challenges of the ecological transition. A report was published in February 2022.

focusing primarily on learning outcomes rather than on detailed program structures. Review cycles are frequently internal and may involve external advisory panels rather than formal state validation.

Across all contexts, however, regulatory frameworks play a dual role. On the one hand, they **impose compliance requirements**—including documentation, reporting, and evidence of learning outcomes. On the other hand, they can **serve as institutional leverage for integrating sustainability competencies into curricula**.

The interviews also highlight the importance of assessment mechanisms in ensuring the effective implementation of sustainability competencies. As several respondents emphasized, curricular changes only become meaningful when they are embedded in evaluation systems:

> *"If it's not credited, it has no value for the student—we simply don't care."*

Another interviewee similarly stressed:

> *"If we don't put it in the grading grid, it falls through the cracks."*

These statements illustrate **how assessment frameworks transform sustainability from a symbolic commitment into an operational teaching objective**.

3. Market and corporate phase

The market phase reflects the interaction between academic programs and their external professional environment. Feedback from employers, industry partners, internship supervisors, and alumni helps identify evolving competency needs and informs adjustments to program content.

Through this feedback loop, institutions seek to maintain the relevance of their programs and ensure that graduate skills remain aligned with labor market expectations. Advisory boards and stakeholder committees frequently play a central role in facilitating this exchange between academia and the professional world.

This phase therefore contributes to closing the curriculum development cycle by r**econnecting pedagogical design with external expectations**.

4. Epistemic and innovation phase

The epistemic phase highlights the evolving nature of sustainability knowledge itself. Scientific developments, societal debates, and regulatory transformations continuously reshape understandings of sustainability, creating new expectations for higher education institutions.

This phase shows that sustainability integration is not a fixed objective but an ongoing process of adaptation. Academic programs must reconcile multiple and sometimes competing

demands, including employer expectations, institutional strategies, disciplinary traditions, pedagogical resources, and student aspirations. Consequently, curriculum development becomes a dynamic process of knowledge negotiation, reflecting broader societal transformations.

Some institutions actively **respond to student demand** as part of this adaptation. For example, at Ecopia, one of the institutions interviewed, workshops such as the Fresque du Climat and Inventons nos vies bas carbone were introduced when most of students expressed interest in these topics. The school then organizes the sessions and even trains students to facilitate the workshops themselves. This is a direct, demand-driven adjustment, though it requires careful balancing: increasing hours for new topics often means reducing time for others to keep the program feasible.

5. Pedagogical and operational phase

The pedagogical phase represents the stage at which strategic and regulatory decisions are translated into concrete teaching practices. At this stage, curriculum transformations become operational through syllabus revisions, the creation of new modules, and the integration of sustainability competencies within existing courses.

Faculty members play a central role in this phase, as they are responsible for adapting course content, designing learning activities, and implementing evaluation methods. Governance structures provide guidance and oversight, but the effectiveness of curricular transformations ultimately depends on pedagogical implementation.

This phase therefore highlights **the importance of institutional translation mechanisms**, ensuring that strategic priorities are translated into pedagogically meaningful practices for instructors and course coordinators.

Structural tensions in sustainability integration

The integration of sustainability into academic programs reveals several structural tensions that shape program design and review.

A first tension emerges between market expectations and societal transformation. Labor markets often prioritize short-term employability and clearly defined professional competencies, whereas sustainability challenges—particularly those related to climate change and environmental transitions—require longer-term systemic thinking and transformative capabilities. This tension is evident in Ecopia, where program design explicitly seeks to balance immediate employability (e.g., skills in extra-financial reporting) with broader transformative objectives, such as preparing students to engage with emerging topics like regenerative economy or diversity and inclusion. The school's strategy emphasizes not only responding to current market demands but also "planting seeds" for students to influence future organizational practices

and societal change.

A second tension concerns the relationship between standardization and innovation within regulatory frameworks. Accreditation systems require standardized competency frameworks and auditable learning outcomes, which may constrain experimental or interdisciplinary approaches to sustainability education.

Finally, governance functions as a central arena for negotiating these tensions. Strategic leadership sets institutional directions, academic governance bodies debate and validate curricular changes, and operational actors translate these decisions into pedagogical systems, evaluation grids, and performance indicators:

> *"For me the real lever is at the governance and executive leadership level. Basically, if executive leadership says, 'Right now, everything is suspended, you hold a meeting and you fix this problem,' then the problem is solved. I think that's the first lever."*

As previously discussed, this process is rarely linear. Instead, it involves **negotiation, compromise, and sometimes resistance**, particularly in relation to academic autonomy.

In this context, governance actors play a crucial role in mediating. By interpreting external frameworks, coordinating stakeholders, and translating sustainability concepts into operational teaching practices, they can facilitate the integration of sustainability within academic programs while reducing the implementation burden placed on individual faculty members.

Discussion and implications

The findings suggest that integrating sustainability into academic programs is less a question of adding new content than **how leadership and governance bodies organize curricular change**. Program evolution appears to be shaped primarily by institutional processes—strategic priorities, regulatory frameworks, and stakeholder interactions—rather than by purely pedagogical initiatives.

In this context, sustainability integration depends largely on the capacity of governance systems to translate strategic intentions into operational curriculum decisions. Program directors and academic committees play a central mediating role by interpreting institutional priorities and aligning them with disciplinary practices and existing program structures.

External frameworks also influence this process in an ambivalent way. While accreditation and regulatory requirements can encourage compliance-driven approaches, they can also provide legitimacy and institutional leverage for integrating sustainability competencies into curricula.

Overall, the results indicate that **meaningful curriculum transformation occurs when institutional strategy, governance coordination, and pedagogical implementation**

are aligned. Without this alignment, sustainability initiatives tend to remain fragmented or limited to isolated initiatives.

Recommendations

Based on these findings, three recommendations emerge for institutions seeking to strengthen sustainability integration in academic programs.

1. **Ensure alignment between strategy, governance, and curriculum processes:** Sustainability integration requires coherence across institutional strategy, governance structures, and program-level implementation. Embedding sustainability into formal curriculum design and review mechanisms is essential to move beyond fragmented or symbolic initiatives.

2. **Mobilize governance actors as key intermediaries:** Program directors, academic leaders, and curriculum committees play a central role in translating strategic priorities into operational teaching practices. Strengthening their capacity, coordination, and institutional support is critical for effective and sustained integration.

3. **Support faculty engagement through structured and sustained pedagogical development:** Faculty training is essential to translate sustainability into disciplinary contexts. These initiatives should be embedded within governance structures, sustained over time, and supported by collective dynamics, rather than relying on isolated or short-term interventions.

Frameworks used to guide program design and sustainability integration

Key findings

The role of institutional and regulatory frameworks

Across the institutions studied, program design and sustainability integration are strongly influenced by a **combination of institutional, national, and international frameworks**. These frameworks structure how competencies are defined, how curricula are evaluated, and how program transformations are legitimized.

All institutions rely on at least one formal framework to guide curriculum development. However, the degree to which these frameworks actively shape pedagogical practices varies significantly. In some cases, they function primarily as administrative or accreditation requirements, while in others they serve as operational tools guiding curriculum transformation and competency alignment.

More broadly, frameworks perform two distinct but interconnected functions:

- **Compliance and legitimacy**: ensuring that programs meet accreditation standards, national regulations, and quality assurance requirements.
- **Strategic leverage:** providing institutional justification and external legitimacy for integrating sustainability competencies into curricula.

Most institutions therefore emphasize the importance of adapting frameworks to local contexts, rather than applying them directly. Frameworks serve as guiding references, but their translation into concrete pedagogical practices requires institutional interpretation and negotiation.

National frameworks
As said earlier, in the French context in particular, program design is strongly structured by national regulatory frameworks. These systems define competency structures, program architecture, and quality assurance requirements, constraining institutional choices.

National framework	Role / requirement	Institutions using this framework
CEFDG (Management schools)	Defines competencies per degree (mandatory blocks), monitors integration of sustainability competencies	GEM, Excelia, ESME, HEC Paris, Audencia, KEDGE, Leonard de Vinci
RNCP / France Compétences	Official certification of state-recognized degrees with associated competencies	Regen School, ESME, HEC, Ecopia
CTI	Accreditation of engineering schools, monitors curriculum and competencies	ESME, ENPC, ENTPE, UniLaSalle
HCERES	Evaluation of university units and academic quality	IUT Nantes, Sciences Po
Internal competency frameworks	Internal monitoring and structuring of sustainability competencies	Excelia, ENTPE, Regen School, Sciences Po Paris (Climate School), Ecopia
CGE / DD&RS	Sustainability framework used by French higher education institutions	ENTPE, Excelia, GEM, IUT Nantes, ESME, ENPC, ESCE

Table 1. French national frameworks guiding curriculum and quality assurance

These frameworks define not only competency structures but also audit procedures, reporting obligations, and quality assurance requirements, which strongly influence how sustainability can be incorporated into curricula.

International frameworks

In addition to national frameworks, many institutions also rely on international standards and accreditation systems. These frameworks often act as drivers of institutional change, especially in globally competitive sectors such as business and engineering education.

International framework	Description	Institutions using this framework
AACSB	Business school accreditation, monitoring learning outcomes and CSR	GEM, HEC Paris, Excelia, Audencia, KEDGE, Leonard de Vinci, ESCE , Leuphana, Sussex
EFMD / EQUIS	Business school accreditation emphasizing sustainability and impact	GEM, HEC Paris, Excelia, Audencia, KEDGE, Leonard de Vinci, ESCE , Sussex, Leuphana
ISO 9001 / ISO 21001	Quality management and educational management systems	Excelia, ENTPE, IUT Nantes, ESME, UniLaSalle
ISO 14001	Environmental management systems	Excelia, ENTPE, IUT Nantes, ESME, UniLaSalle
ISO 26000	Corporate social responsibility guidance	ENPC, IUT Nantes
UNESCO ESD / SDGs	Strategic guidance for sustainability integration in education	Regen School, Jindal School, Ecopia, Sussex, KAUST
GreenComp	European sustainability competency framework	ENPC, GEM, HEC, Excelia, UniLaSalle
STARS	Sustainability assessment and certification system	UTEC
Positive Impact Rating	Student-based evaluation of societal impact	University of Gothenburg

Table 2. International frameworks or systems of quality assurance

Taken together, these frameworks inform a multi-layered governance environment, where institutional strategy, regulatory compliance, and pedagogical innovation interact.

Typology of sustainability integration models

Building on the empirical analysis, a typology of institutional approaches to sustainability integration was constructed. The typology is based on four analytical criteria: governance structure, pace of curricular change, intensity of sustainability integration, influence of external regulations.

Three main models emerge.

1. Incremental compliance
In this model, sustainability integration primarily results from **external pressures**, such as accreditation requirements, rankings, ministerial recommendations, or evolving scientific reports.

Institutions respond by introducing relatively limited curricular adjustments: adding dedicated modules, incorporating sustainability competencies into existing frameworks, or modifying certain evaluation criteria. However, the **overall architecture of the program remains largely unchanged**.

Sustainability therefore appears as an additional layer within the curriculum rather than as a structuring principle. Disciplinary logics remain dominant and the core structure of the program remains stable.

This approach is institutionally rational. It minimizes risks, ensures regulatory compliance, and protects internal equilibrium. However, it rarely leads to profound curriculum transformation.

2. Strategic framework integration
In the second model, sustainability becomes **part of a planned institutional strategy** rather than simply a response to external constraints.

Leadership defines a roadmap, governance bodies coordinate transformation, and instructors as well as external partners are actively involved in curriculum redesign. Sustainability competencies are progressively aligned with relevant institutional or international frameworks.

The objective is to create **institutional coherence:** sustainability becomes a structuring axis of the program, but changes remain embedded within existing governance and accreditation structures.

Transformation is therefore gradual but coordinated. Governance plays a central role in orchestrating alignment between institutional strategy, pedagogical implementation, and external frameworks.

3. Strategic transformation
The third model corresponds to situations where sustainability acts as a trigger for major institutional transformation.

In these cases, sustainability does not merely complement existing programs but redefines them. Institutions may create entirely new degrees, redesign existing curricula from the ground up, or redefine the objectives and competencies associated with diplomas.

Such transformations typically involve significant mobilization of resources and a willingness from leadership to challenge established disciplinary structures.

Frameworks and accreditation systems still play a role, but primarily as instruments to legitimize innovation rather than to constrain it.

Importantly, several institutions combine multiple models depending on the program or degree level.

Type of Integration	Number of Institutions	Description
Incremental compliance	7	Gradual integration mainly responding to external requirements such as accreditations and frameworks. Changes focus on syllabi and assessment rather than structural transformation.
Strategic framework integration	8	Sustainability integrated within a strategic vision led by academic governance and co-designed with faculty and external partners.
Strategic transformation	5	Sustainability becomes a driver of major curriculum transformation and institutional repositioning.

Table 3. Summary of sustainability integration models

Positioning the findings within the literature

The typology identified in this study resonates with existing research on sustainability integration in higher education, particularly the distinction between **vertical and horizontal integration approaches**.

Vertical integration refers to the creation of **dedicated sustainability courses within the curriculum**. This approach allows students to acquire fundamental sustainability knowledge and concepts. Watson et al. (2013) highlight that such courses play an important role in introducing key theoretical foundations.

However, several authors argue that isolated courses risk marginalizing sustainability within the curriculum. Peet et al. (2004) note that stand-alone courses do not necessarily encourage students to integrate sustainability considerations into professional decision-making. By contrast, **horizontal** integration refers to the **embedding of sustainability across multiple courses and disciplines**, promoting interdisciplinary perspectives and systemic thinking. Scholars such as Wals and Jickling (2002) and Juárez-Nájera et al. (2006) emphasize that this approach enables students to understand sustainability as a cross-cutting issue rather than as a specialized topic. Similarly, Watson et al. (2013) also observe that integrating sustainability within existing technical courses helps students perceive sustainability as an inherent component of professional practice.

The typology developed in this research extends this debate by demonstrating that **sustainability integration is not only a pedagogical choice but also a governance and institutional strategy issue**. The three models identified—incremental compliance, strategic frameworked integration, and deliberate strategic break—illustrate how institutional positioning, regulatory frameworks, and leadership dynamics shape the depth and pace of curriculum transformation.

Discussion and implications

Overall, the findings highlight that sustainability integration within higher education programs is not driven by a single factor but according to different phases, through the interaction between various internal and external actors.

Frameworks provide both constraints and opportunities. While accreditation requirements may initially encourage compliance-oriented integration, they can also create institutional momentum for broader transformations.

At the same time, the typology demonstrates that deeper transformations occur primarily when institutional leadership actively mobilizes governance structures and resources, moving beyond purely regulatory responses.

Recommendations

Based on these findings, three recommendations emerge for institutions seeking to strengthen sustainability integration in academic programs.

1. **Use frameworks strategically rather than administratively,** translating competency standards into operational pedagogical tools.

2. **Strengthen governance coordination** between strategic leadership, program directors, and faculty members to ensure coherent implementation.

3. **Move beyond isolated sustainability courses** toward integrated curriculum approaches combining horizontal and vertical integration.

Barriers and levers for sustainability education

Key findings

The integration of sustainability into academic programs depends not only on institutional frameworks and governance structures but on a set of **organizational conditions that either facilitate or hinder implementation**. Interview data reveal that sustainability integration is shaped by a combination of institutional support mechanisms, faculty engagement, operational constraints, and the capacity of institutions to **measure and monitor sustainability within curricula**.

Across institutions, respondents consistently highlighted a number of **key levers that enable sustainability integration**, as well as **structural barriers** that may slow or limit the depth of transformation. These factors operate at different levels of the institution, including leadership strategy, pedagogical practices, faculty capacity, governance mechanisms, and evaluation systems.

Levers	Barriers or risks
Strong institutional support – leadership treats sustainability as an explicit strategic priority.	Administrative over-compliance – applying frameworks declaratively without real impact on teaching.
Valuing existing practices – building on initiatives already implemented by faculty; gradual and motivating approach.	Additional workload for faculty – excessive tools or formal requirements can create resistance or disengagement.
Faculty training – ownership through training, awareness, and translation of sustainability concepts into disciplinary terms.	Difficulty translating sustainability into concrete content – even trained faculty may struggle to define precise learning objectives.
Engagement of all staff – coordination between teaching staff, administrative teams, sustainability officers, and leadership.	Limited post-graduation follow-up – difficulty measuring long-term impact of sustainability competencies in professional practice.
Communication and recognition – visibility and reward of faculty and student initiatives through certifications, awards, or participation in international networks.	Fragmented measurement tools – difficulty linking mapping, assessment, and learning outcomes.
Curriculum governance and feedback mechanisms – programme committees, accreditation audits, and student/employer feedback support curriculum evolution.	Overlapping frameworks – SDGs, GreenComp, DDRS, ISO 26000 etc. can create complexity and administrative burden.
Measurement and monitoring systems – mapping courses, assessing student competencies, and tracking sustainability literacy help guide program improvements.	Indicators focused on inputs rather than outcomes – presence of sustainability topics does not necessarily reflect real competencies.

Table 4. Summary of levers and barriers or risks

Key institutional levers

A central enabling factor identified across the institutions studied is **strong institutional commitment from leadership**. When sustainability is explicitly integrated into institutional strategy, it provides legitimacy and direction for program transformation. Strategic positioning helps mobilize resources, align governance structures, and encourage faculty engagement.

Another important lever is the **recognition of existing initiatives**. Rather than imposing entirely new frameworks, several institutions reported adopting a gradual approach by identifying and strengthening sustainability-related practices already present within courses or research activities. This incremental approach helps build faculty ownership and reduces resistance to change, as highlighted in this verbatim:

> *"I approached it in a fairly positive way, meaning that I didn't go to my faculty members and researchers saying: 'you do nothing'. I went to see them saying: 'I did the work for you to show that the glass is already half full'. So, it was a somewhat pedagogical way, if I can use that term, of approaching the faculty members. Because otherwise their first reaction would be to say: 'here we go again, this is a new directive we must deal with'. Whereas in fact it was a bit like the example I showed with my Excel sheets (demonstrating how teachers were already covering some concepts of sustainability in their courses). In the end, we actually do this every day with our students. Then, among them, there are also some faculty members who—even with a new programme—may not have completely updated their module. So, you have to show them that there may be things to add."*

Faculty training also emerged as a critical enabling condition. Sustainability integration often requires instructors to translate complex environmental and social issues into disciplinary contexts. Training programs and workshops therefore play a key role in helping faculty members develop appropriate pedagogical approaches and learning objectives.

Another important lever concerns **institutionalized curriculum review and feedback mechanisms**. Several institutions explained that sustainability-related developments are progressively integrated through existing governance structures such as programme committees, accreditation audits, and advisory boards. These forums allow institutions to identify emerging topics, assess whether current curricula adequately address them, and adjust teaching content accordingly. Feedback from students and employers also plays an important role in highlighting gaps between professional expectations and course content, thereby encouraging continuous adaptation of programs.

> *"Regarding developments, it's about the ability to capture the right topics during the ACD (Assembly of department heads) meetings and say: 'this needs to evolve'. I'll take again the example of the double materiality matrix. Now it must appear clearly; for environmental accounting, we need to move from two hours to ten hours of teaching. (...) When we look at the results of the audit for our certification, it allows us*

to see whether there are topics we need to address. There are also the program advisory boards, where our students can tell us: 'Yes, but I'm doing an apprenticeship and my company asked me about this, yet we didn't cover it in class.'"

Finally, institutions highlighted the importance of **coordinated engagement across different institutional actors**, including academic staff, program managers, sustainability officers, and administrative teams. Successful integration depends on collaboration across these roles rather than on individual initiatives alone.

Structural barriers

Alongside these enabling conditions, several barriers were identified.

One frequently mentioned challenge concerns **administrative over-compliance**. When sustainability frameworks are implemented primarily to satisfy accreditation requirements, they risk remaining symbolic rather than producing meaningful pedagogical change.

Another significant constraint relates to **faculty workload**. The introduction of new competency frameworks, reporting requirements, or evaluation mechanisms may increase administrative burdens for instructors. Without adequate support, these additional demands can generate resistance or disengagement.

Respondents also emphasized the **difficulty of translating sustainability into concrete disciplinary content**. Even when faculty members recognize the importance of sustainability, defining measurable learning outcomes and integrating them into existing courses can be challenging.

Finally, institutions highlighted the **difficulty of evaluating the long-term impact of sustainability education**. While competencies may be incorporated into curricula, it remains difficult to assess how graduates apply these skills in their professional careers.

Examples of faculty training initiatives

To address these challenges, several institutions have implemented training initiatives aimed at supporting faculty members in integrating sustainability into their teaching practices. These initiatives include workshops on sustainability competencies, interdisciplinary seminars, and internal pedagogical development programs designed to translate sustainability frameworks into course-level learning objectives.

The cases studied illustrate different levels of structuring and impact. Some institutions rely on **short, targeted formats**, such as the micro-training programs developed at Excelia ("Workshops of the Future", "Sustainability Mindset"), designed to foster a sustainability mindset among staff. While these initiatives contribute to awareness-raising, their continuity and

impact remain fragile when they depend on a limited number of individuals and are not fully embedded in institutional governance.

Similarly, at IUT Nantes, a more intensive training cycle (4,5 days) was implemented in partnership with the Campus de la Transition. Although this format provides deeper engagement, its reach remains limited due to the small number of staff participating, raising questions about scalability within the institution.

Other institutions adopt a more **integrated pedagogical approach**. At ESME, faculty training focuses on enabling instructors to embed sustainability within existing courses rather than relying on standalone modules delivered by external lecturers. This shift was partly motivated by earlier experiences where sustainability teaching had been outsourced, which "had become the project of the academic affairs department only, and not that of the school's faculty and researchers." In contrast, the new approach has led to strong faculty appropriation and the progressive integration of sustainability into teaching and final-year projects. However, this case also reveals a **discrepancy between faculty engagement and student uptake**. While many teachers actively incorporated sustainability into their courses, student interest remained uneven, with a significant share of students continuing to prioritize technical content over broader sustainability-related issues.

Finally, a more **systemic model** can be observed at Regen School, where faculty development is embedded within the institutional model itself. Structured onboarding, continuous communication, and regular collective seminars contribute to building a shared pedagogical framework and a community of practice. In this case, sustainability is not introduced through isolated training initiatives but through an ongoing process of professional development aligned with the institution's educational vision.

Overall, these examples show that faculty training initiatives, just like sustainability education for students, are most effective when they move beyond isolated interventions and are sustained through governance structures, collective dynamics, and institutional support.

Monitoring and measuring sustainability integration

Beyond governance and institutional commitment, interviews also revealed the growing need to objectively map courses in order to **track and measure sustainability integration into the curricula**.

Many institutions have begun implementing **curriculum mapping mechanisms** to identify where sustainability topics appear within courses and programs. These mechanisms may involve the systematic review of syllabi, the use of sustainability-related keywords, or declarative mapping systems in which instructors indicate the extent to which sustainability themes

are addressed in their courses. Frameworks such as the **SDGs, GreenComp, DDRS** (French framework), **CDEFM** (French framework for Business schools), **or ISO 26000** are sometimes used to structure this mapping and categorize competencies.

Institutions may also include other stakeholders in the mapping process, for example:

- UniLaSalle and the University of Sussex combine curriculum mapping with student perception surveys.
- KAUST integrates SDG mapping within course syllabi while involving students in the process.

The main objective of these initiatives is to **obtain an overall view of sustainability coverage across programs**, identify gaps, and support curriculum reforms.

Some institutions also rely on **student assessment tools** to evaluate sustainability literacy. **TASK™ (The Assessment of Sustainability Knowledge)** is one of the most widely cited instruments and is often administered at different stages of a program to observe student progression.

Other complementary approaches include:

- reflective assignments and sustainability reports
- project-based assessments (such as “ProAct” projects)
- self-assessment surveys capturing student perceptions of sustainability integration.

These methods can help teaching teams identify areas where sustainability competencies are effectively developed and where additional pedagogical efforts may be needed.

However, respondents emphasized that **measurement systems remain uneven and often limited**. Many mapping approaches rely primarily on teacher declarations, which may not accurately reflect the depth of sustainability integration in practice. In addition, most indicators **focus on inputs**—such as the presence of sustainability topics in course descriptions—**rather than learning outcomes or competencies acquired by students**.

Another challenge concerns the **complexity created by multiple sustainability frameworks**, which may generate additional workload for instructors and complicate data consolidation.

As a result, many institutions still struggle to connect three key elements: intended sustainability competencies, course content, and student learning outcomes.

Phases of institutional maturity in sustainability monitoring

Interviews suggest that institutions tend to evolve through several stages in their approach to sustainability integration and measurement.

Phase	Description	Examples
Descriptive / Declarative	Basic mapping of courses and teacher declarations to identify sustainability content.	Course mapping using simple scales (0-1-2), syllabus review.
Structuring / Work in progress	Progressive alignment of courses with sustainability frameworks and identification of curriculum gaps.	Mapping syllabi with SDGs or GreenComp, identifying missing competencies.
Integration / Advanced management	Longitudinal monitoring of sustainability competencies across programs and cohorts.	Portfolio tracking, competency-based assessment, alumni feedback.

Table 5. Phases of institutional maturity in sustainability monitoring

Discussion and implications

Findings suggest sustainability integration in higher education is **not solely a matter of curriculum design but also an organizational change process**. Institutional commitment, faculty engagement, governance mechanisms, and measurement tools all play critical roles in determining whether sustainability becomes embedded within teaching pratices.

Importantly, results show that frameworks and accreditation requirements alone are insufficient to drive meaningful transformation. Without adequate institutional support and faculty ownership, **sustainability risks remaining a formal requirement rather than a substantive educational objective**.

Conversely, when institutions combine **strategic leadership, faculty training, governance processes, and monitoring tools**,

sustainability integration is more likely to become embedded within program structures and pedagogical practices.

Recommendations

Based on these findings, several recommendations can be formulated for higher education institutions seeking to strengthen sustainability integration:

1. **Ensure strong strategic commitment from leadership**, clearly positioning sustainability as a core institutional priority, as previously stated.

2. **Invest in faculty training and pedagogical support**, enabling instructors to translate sustainability concepts into disciplinary teaching practices, and ensure that these initiatives are embedded within governance structures, sustained over time, and supported by collective faculty engagement rather than remaining isolated interventions.

3. **Avoid purely compliance-driven approaches**, ensuring that frameworks are used as pedagogical tools rather than administrative obligations.

4. **Recognize and valorize existing initiatives**, encouraging faculty engagement through incentives, awards, and visibility.

5. **Develop systematic mechanisms to map and monitor sustainability integration within curricula**, such as curriculum mapping tools, competency frameworks, and student assessment instruments to track where sustainability knowledge and skills are taught, identify gaps, and support continuous program improvement.

6. **Strengthen mechanisms to monitor long-term outcomes**, including alumni feedback, employer perspectives, and longitudinal assessment of sustainability competencies in professional practice.

Conclusion

This research demonstrates that **embedding sustainability into academic programs constitutes a complex organizational transformation process shaped by governance structures, leadership decisions, and the interaction between several stakeholders**. By shifting the analytical focus toward academic governance and institutional work, this study highlights how sustainability is continuously interpreted, negotiated, and translated into curricular reality. Program directors, academic committees, and leadership bodies act as critical intermediaries, ensuring alignment—or revealing misalignment—between strategic intent and pedagogical implementation. The findings show that curriculum transformation is iterative and embedded in multi-layered processes rather than linear design models.

The study also highlights the **ambivalent role of frameworks and accreditation systems**. While often perceived as compliance mechanisms, they can equally serve as **sources of legitimacy and strategic leverage**, enabling institutions to advance sustainability agendas when actively mobilized. However, their effectiveness ultimately depends on how they are interpreted and operationalized within local institutional contexts.

Importantly, the typology developed in this research confirms that sustainability integration reflects broader institutional positioning. Whether through incremental adjustments, structured framework-based approaches, or more transformative strategic shifts, **the depth of integration is closely tied to leadership commitment, governance coordination, and resource allocation**.

Overall, the findings suggest that **meaningful and lasting integration of sustainability occurs only when three dimensions are aligned: institutional strategy, governance processes, and pedagogical practices**. Absent this alignment, sustainability initiatives risk remaining fragmented, symbolic, or confined to isolated components of the curriculum.

A practical implication of this research concerns the **need to better monitor and support what is effectively implemented within programs**. While many faculty members are willing to engage with sustainability, they often face significant barriers, including limited training, lack of pedagogical resources, and an uneven sense of legitimacy to address sustainability within their disciplines. This heterogeneity calls for differentiated and scalable capacity-building approaches that go beyond awareness-raising. This dual focus on monitoring and empowerment is essential. Without visibility on actual teaching practices, sustainability remains a strategic abstraction; without faculty ownership and capacity-building, it risks remaining a formal requirement.

This research contributes both empirically and theoretically by framing sustainability integration as an institutional change process driven by agency within constraints. It also offers practical implications for higher education institutions: **advancing sustainability requires not only formal frameworks but also active leadership, engaged faculty, supportive governance mechanisms, robust monitoring systems, and sustained investment in faculty development**. Future efforts should therefore focus on strengthening these organizational conditions to move sustainability from strategic ambition to embedded educational practice.

Methodology

Research design

This research is based on a **qualitative study** conducted through semi-structured interviews with representatives of higher-education institutions engaged in the integration of sustainability into their curricula. The objective was to understand the life-cycle of academic programs and how institutions were embedding sustainability into the curricula.

In total, **22 interviews** were conducted, representing **26 participants**, as some interviews involved several respondents simultaneously.

Institutional sample

The study covers a diverse set of institutions, primarily located in France (14) but complemented by several international universities (7). The sample includes **business schools, engineering schools, universities, and institutions specialized in sustainability and environmental education**, enabling comparison across disciplinary and organizational contexts.

Overall, the sample includes **16 established institutions and 5 more recently created structures**. This distinction made it possible to examine different approaches to sustainability integration:

- how long-established institutions incorporate sustainability within existing curricular and governance structures
- how recent institutions design programs around sustainability from the outset

Type	Institutions	Number
Business / Management Schools	Audencia, KEDGE, Grenoble EM, ESCE, HEC Paris, Leonard de Vinci, Regen School	7
Universities / University Units	IUT Nantes, University of Sussex, UTEC (Uruguay), Leuphana University, KAUST, Rennes University, University of Gothenburg (School of Business, Economics and Law)	7
Engineering Schools	ENPC, UniLaSalle, ENTPE, ESME	4
Sustainability-focused Schools	Jindal School of Environment & Sustainability, Ecopia, Sciences Po Paris – School of Climate	3

Table 6. Name and type of institutions interviewed

Profile of interviewees

Interviews were carried out with individuals occupying strategic or coordination roles, enabling a high-level perspective on institutional strategies, governance mechanisms, and curriculum evolution related to sustainability.

Role	Number of interviewees
Leadership (Dean / Deputy / Executive Directors)	7
Academic Directors	5
CSR / Sustainability Leads	6
Program Directors	4
Accreditation / Quality Leads	3
Teaching Leads	1

Table 7. Role of profiles interviewed

Data collection

Data was collected through **semi-structured interviews** using a pre-defined guide that balanced consistency across participants with flexibility to explore context-specific insights. Interviews were conducted online (Teams) in English or French and lasted approximately **80 minutes each**. Some sessions included multiple participants.

The guide addressed several key themes:

- Participant roles and institutional context: understanding responsibilities, strategic priorities, and program positioning within the institution.
- Curriculum design and program life-cycle: capturing how programs are developed, revised, and managed in practice.
- Sustainability integration: exploring definitions, frameworks (e.g., SDGs, PRME, national standards), and practical approaches used to embed sustainability.
- Measurement, data, and improvement mechanisms: assessing how sustainability is monitored, evaluated, and used to inform program redesign.
- Challenges, enablers, and opportunities: capturing barriers and opportunities to strengthen sustainability integration across programs.

Interviews were recorded and transcribed to facilitate systematic analysis.

Data analysis

The data were analyzed using a **thematic analysis** approach. Transcripts were reviewed and coded iteratively to identify recurring themes, patterns, and institutional practices related to sustainability integration.

The analysis followed a structured, multi-stage approach:

1. Familiarization: Transcripts were read multiple times to gain a deep understanding of the content.

2. Open coding: Key concepts and ideas emerging from the interviews were systematically identified.

3. Summary sheets: For each interview, a concise summary sheet was created, highlighting central themes and insights.

4. Thematic grouping and comparative analysis: Codes were organized into broader categories. Patterns, similarities, and differences were examined across institutions to identify recurring themes and unique practices.

This process ensured a rigorous, transparent, and structured analysis while capturing both shared experiences and institutions specificities.

Explanations and limitations of the sample

Several limitations should be acknowledged. First, we chose to interview people who occupy strategic or managerial roles, which provides valuable insight into institutional governance but may underrepresent the perspectives of individual faculty members or students involved in day-to-day teaching practices.

Second, some types of institutions are relatively overrepresented in the sample compared with others, which may influence the findings. As a result, certain observations may reflect trends specific to those institutions rather than the full diversity of higher-education contexts.

Third, although the study includes several international institutions, the sample remains predominantly French, which may limit the generalizability of some observations to other higher-education systems.

Fourth, as a qualitative exploratory study, the objective is not statistical representativeness but rather to generate insights into institutional dynamics, governance, and practices that support sustainability integration in higher education programs.

References

Acquah, E. (2010). *A Growth Model for Academic Program Life Cycle (Aplc): A Theoretical and Empirircal Analysis*. https://www.academia.edu/99234421/A_Growth_Model_for_Academic_Program_Life_Cycle_Aplc_A_Theoretical_and_Empirircal_Analysis

Aghajani, M., Memari, A., Tumpa, R. J., & Ruge, G. (2025). Systematic exploration of sustainability in higher education : A tertiary perspective. *International Journal of Sustainability in Higher Education*, *26*(4), 965-983. https://doi.org/10.1108/IJSHE-02-2024-0095

Barth, M., & Rieckmann, M. (2016). *State of the Art in Research on Higher Education for Sustainable Development* (p. 100-113).

Belinda A. Christie, Kelly K. Miller, Raylene Cooke & John G. White (2015) Environmental sustainability in higher education: What do academics think?, *Environmental Education Research, 21*(5), 655-686, https://doi.org/10.1080/13504622.2013.879697

Blanco-Portela, N., Benayas, J., Pertierra, L., & Lozano, R. (2017). Towards the integration of sustainability in Higher Education Institutions : A review of drivers of and barriers to organisational change and comparison against those found of companies. *Journal of Cleaner Production*, *166*. https://doi.org/10.1016/j.jclepro.2017.07.252

Hallinger, P., & Suriyankietkaew, S. (2018). Science Mapping of the Knowledge Base on Sustainable Leadership, 1990–2018. *Sustainability*, *10*(12), 4846. https://doi.org/10.3390/su10124846

Juárez-Nájera, M., Dieleman, H., & Turpin-Marion, S. (2006). Sustainability in Mexican Higher Education : Towards a new academic and professional culture. *Journal of Cleaner Production*, *14*, 1028-1038. https://doi.org/10.1016/j.jclepro.2005.11.049

Lattu, A., & Cai, Y. (2020). *Tensions in the Sustainability of Higher Education - the Case of Finnish Universities*. https://doi.org/10.3390/su12051941

Lawrence, T., & Suddaby, R. (2006). Institutions and institutional work. In *Handbook of Organization Studies* (Vol. 2, p. 215-254). https://doi.org/10.4135/9781848608030.n7

Leal Filho, W., Eustachio, J. H. P. P., Caldana, A. C. F., Will, M., Lange Salvia, A., Rampasso, I. S., Anholon, R., Platje, J., & Kovaleva, M. (2020). Sustainability Leadership in Higher Education Institutions : An Overview of Challenges. *Sustainability*, *12*(9), 3761. https://doi.org/10.3390/su12093761

Lozano, R., Barreiro-Gen, M., Lozano, F. J., & Sammalisto, K. (2019). Teaching Sustainability in European Higher Education Institutions : Assessing the Connections between Competences and Pedagogical Approaches. *Sustainability*, *11*(6), 1602. https://doi.org/10.3390/su11061602

Peet, D.-J., Mulder, K., & Bijma, A. (2004). Integrating SD into engineering courses at the Delft University of Technology. International *Journal of Sustainability in Higher Education*, *5*, 278-288. https://doi.org/10.1108/14676370410546420

Robinson, K. F., Baker, E., Ewing, E., Hemming, V., Kenney, M. A., & Runge, M. C. (2023). Decision Analysis to Advance Environmental Sustainability. *Decision Analysis*, *20*(4), 243-251. https://doi.org/10.1287/deca.2023.intro.v20.n4

Serafini, P., de Moura, J., Almeida, M., & Rezende, J. (2022). Sustainable Development Goals in Higher Education Institutions : A systematic literature review. J*ournal of Cleaner Production*, *370*, 133473. https://doi.org/10.1016/j.jclepro.2022.133473

Shih, Y.-H., Hsu, M. C., & Chang, C. L. (2025). Sustainability Transformations in Higher Education : Global Perspectives on The Challenges and Solutions. *International Journal of Education and Humanities*, *5*(1), 126-139. https://doi.org/10.58557/(ijeh).v5i1.290

Trevisan, A., Acerbi, F., Dukovska-Popovska, I., Terzi, S., & Sassanelli, C. (2024). Skills for the twin transition in manufacturing : A systematic literature review. *Journal of Cleaner Production, 474*, 143603. https://doi.org/10.1016/j.jclepro.2024.143603

Veidemane, A., Craciun, D., & van der Meulen, B. (2025). Critical sustainability events and perceived roles of academic leaders at a leading university in sustainability : CIT case study. *Discover Sustainability*, *6*(1), 468. https://doi.org/10.1007/s43621-025-01185-x

Visser, W., & Courtice, P. (2011). Sustainability Leadership : Linking Theory and Practice. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.1947221

Wals, A. E. J., & Jickling, B. (2002). “Sustainability” in higher education : From doublethink and newspeak to critical thinking and meaningful learning. *Higher Education Policy, Sustainability and Higher Education: Initiatives and Agendas, 15*(2), 121-131. https://doi.org/10.1016/S0952-8733(02)00003-X

Watson, M. K., Lozano, R., Noyes, C., & Rodgers, M. (2013). Assessing curricula contribution to sustainability more holistically : Experiences from the integration of curricula assessment and students’ perceptions at the Georgia Institute of Technology. *Journal of Cleaner Production, 61,* 106-116. https://doi.org/10.1016/j.jclepro.2013.09.010

Weiss, M., Barth, M., & von Wehrden, H. (2021). The patterns of curriculum change processes that embed sustainability in higher education institutions. *Sustainability Science, 16*(5), 1579-1593. https://doi.org/10.1007/s11625-021-00984-1

Weiss, M., Barth, M., Wiek, A., & von Wehrden, H. (2021). Drivers and Barriers of Implementing Sustainability Curricula in Higher Education—Assumptions and Evidence. *Higher Education Studies, 11,* 42-42. https://doi.org/10.5539/hes.v11n2p42

Appendix A - Institutions interviewed

France

- Audencia Business School
- École des Ponts ParisTech (ENPC)
- Ecopia School
- ENTPE
- ESCE International Business School
- ESME
- Excelia Business School
- Grenoble Ecole de Management
- HEC Paris
- IUT Nantes
- KEDGE Business School
- Léonard de Vinci Pôle Universitaire
- Regen School
- UniLaSalle

Germany

- Leuphana School of Management and Technology

India

- Jindal School of Environment and Sustainability

Uruguay

- Universidad Tecnológica del Uruguay

Saudi Arabia

- King Abdullah University of Science and Technology

Sweden

- University of Gothenburg

United Kingdom

- University of Sussex Business School