GREENUS

LEARNING
ENGAGEMENT
ACTION

GREEN LEAF

Developing, implementing and evaluating greening curricula

A guidebook for faculty, policymakers and practitioners

Learning

Engagement

Action

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Executive Summary

This guidebook was developed within the **GREEN LEAF architecture – Learning, Engagement and Action** as a practical resource for greening higher education curricula. It addresses curriculum greening as a process that goes beyond introducing sustainability topics into existing courses. Learning outcomes and content matter, but so do the ways students learn, the environments in which learning takes place, assessment, collaboration with others and opportunities to work with sustainability challenges in practice.

The guidebook is organised around the three dimensions of GREEN LEAF: **Learning, Engagement** and **Action**. *Learning* focuses on what students need to learn about and for sustainability and on the educational choices that support this learning. It covers learning outcomes, curriculum content, pedagogical approaches, learning environments and assessment. *Engagement* looks at the people involved. Students, educators, institutional actors and external stakeholders all have a role in shaping relevant learning experiences and connecting curricula with their wider social and environmental contexts. *Action* concerns what happens with this learning: how ideas are tested in practice, how curriculum initiatives are implemented and how they can contribute to change within and beyond the university.

The guidebook draws on evidence synthesis, consultation with stakeholders, learner perspectives and co-creation undertaken during the development of GREEN LEAF. These different sources also made one point particularly clear: there is no single route to greening a curriculum. Institutions, programmes and educators work in different contexts and start from different places. For this reason, the guidebook proposes a common direction and a set of steps, questions and resources that can be adapted to the context in which they are used.

Its practical sections accompany users through this process. They support the review of existing curricula, the definition of green learning outcomes, decisions about content and pedagogy, the design of learning environments and assessment, stakeholder engagement, and the implementation and evaluation of curriculum changes. Tools and examples are included where they can help users work through these decisions rather than simply read about them.

The *Green Learning Ambassadors* add a living dimension to this work. Students, educators, researchers, practitioners and community actors can act as connectors within and across institutions, share experiences, initiate conversations and activities, and bring new practices back into the GREEN LEAF community. Their role is particularly important because curriculum greening is unlikely to follow a fixed or finished model; it develops as people try things, learn from them and exchange what they have learned.

The guidebook can be used to rethink a course, support work at programme level or inform broader institutional initiatives. Its purpose is straightforward: to give educators and institutions a usable way of working with *Learning, Engagement* and *Action,* while leaving enough room for each university, programme and learning community to decide what curriculum greening should look like in its own context.

Orientation

Why This Manual Exists

The gap: recognition vs implementation

Across higher education systems worldwide, sustainability and climate action have become firmly established as strategic educational priorities. Universities increasingly adopt sustainability strategies, endorse international declarations, establish green offices, and align institutional agendas with the Sustainable Development Goals (SDGs). References to sustainability now appear in mission statements, institutional development plans, quality assurance frameworks, and public engagement initiatives.

However, institutional recognition has not consistently translated into systemic curriculum transformation. In many higher education contexts, sustainability remains unevenly embedded, often confined to isolated courses, elective modules, extracurricular projects, or the efforts of individual academic champions. While many faculty members acknowledge the importance of sustainability education, they frequently report uncertainty regarding how to integrate sustainability meaningfully into curriculum design, pedagogy, assessment, and disciplinary practice. As a result, many initiatives remain dependent on individual motivation rather than supported through coherent institutional structures, governance mechanisms, or long-term implementation strategies.

This disconnect between strategic commitment, and operational implementation is reflected in international evidence. UNESCO highlights that many education systems continue to face significant challenges in embedding climate change and sustainability comprehensively across curricula, teacher education, and institutional practices. Global analyses have shown that a substantial proportion of curriculum frameworks still lack explicit references to climate change, while many educators report insufficient preparation, confidence, or institutional support to address sustainability-related topics effectively within their teaching.

At the same time, expectations placed upon higher education institutions are rapidly evolving. Students increasingly expect universities to prepare them not only for employment, but also for participation in societies shaped by ecological transition, technological transformation, social inequality, and global uncertainty. Sustainability is therefore no longer perceived as a peripheral or specialized topic. It is increasingly understood as a core dimension of graduate preparedness, professional responsibility, civic engagement, and institutional relevance.

This manual emerges in response to this growing gap between aspiration and implementation. Its purpose is to support institutions, educators, policymakers, and partners in moving beyond symbolic commitment toward coherent, actionable, and institutionally embedded approaches to curriculum greening.

From isolated initiatives to systemic change

Greening curricula cannot be reduced to the simple addition of environmental topics within existing courses or programmes. Rather, it requires a broader institutional transformation that reshapes how higher education conceptualizes learning, teaching, assessment, collaboration, and institutional responsibility in relation to sustainability and societal change. Curriculum greening therefore involves not only revising content, but also reconsidering the purposes of education, the relationships between disciplines, the role of learners and educators, and the connections between universities and the wider communities they serve.

The GREEN LEAF Framework approaches curriculum greening as a systemic, participatory, and action-oriented process structured around three interconnected pillars:

- **Learning** — transforming both what learners engage with and how learning experiences are designed, with a focus on sustainability competences, systems thinking, interdisciplinarity, and transformative pedagogies;
- **Engagement** — developing collaborative learning ecosystems that connect educators, students, policymakers, civil society organizations, industry actors, and local communities as co-creators of sustainability learning;
- **Action** — embedding sustainability within institutional governance, implementation processes, evaluation mechanisms, and long-term organizational transformation.

Together, these pillars position curriculum greening as an institution-wide process of cultural, pedagogical, and structural change. This perspective aligns with international frameworks that emphasize whole-institution approaches, interdisciplinary learning, systems-oriented thinking, stakeholder participation, community engagement, and action-oriented sustainability education.

Accordingly, this manual moves beyond symbolic commitments and fragmented initiatives by providing practical guidance for embedding sustainability across multiple dimensions of higher education practice, including:

- sustainability learning outcomes and graduate competences;
- curriculum and course design;
- pedagogical and experiential learning approaches;
- assessment and evaluation strategies;
- institutional governance and leadership structures;
- stakeholder and community collaboration;
- monitoring, quality assurance, and continuous improvement processes.

At the same time, the manual recognizes that there is no universal model for curriculum greening. Higher education institutions operate within diverse disciplinary traditions, governance structures, policy

environments, cultural contexts, and resource conditions. Sustainability challenges themselves also vary significantly across regions and communities. For this reason, the guide does not propose prescriptive solutions or fixed implementation models. Instead, it offers adaptable pathways, reflective tools, and flexible frameworks that institutions may interpret and operationalize according to their own contexts, priorities, capacities, and trajectories of change.

Who this manual is for

This manual is designed for multiple stakeholders involved in curriculum transformation and sustainability implementation.

Faculty and Educators

Faculty members can use the guide to redesign courses, integrate sustainability competences, adopt transformative pedagogies, and align assessment with sustainability learning outcomes.

Programme Directors and Curriculum Committees

Programme leaders and curriculum committees can use the manual to conduct curriculum mapping, identify gaps, coordinate interdisciplinary integration, and support programme-level transformation.

Deans and Institutional Leaders

Institutional leaders can use the guide to align curriculum greening with institutional strategies, governance structures, accreditation processes, and sustainability goals.

Policymakers and Accreditation Bodies

Policymakers may use the manual to develop supportive frameworks, funding mechanisms, quality standards, and national strategies for greening higher education.

NGOs, Civil Society Organizations, and Community Partners

External stakeholders can use the guide to build partnerships with higher education institutions and contribute expertise, real-world challenges, community engagement opportunities, and co-creation processes.

Students and Green Learning Ambassadors

Students and sustainability advocates may use the guide to support peer learning, institutional engagement, challenge-based projects, and sustainability leadership initiatives.

How to use this guide

The manual is designed as both:

- a practical implementation toolkit;
- and a strategic transformation framework.

Users can engage with the manual in different ways depending on their institutional context, readiness level, and objectives.

Quick-Start Pathway

The Quick-Start Pathway is designed for institutions, programme teams, and educators seeking practical and achievable entry points for curriculum greening. Rather than requiring large-scale institutional reform from the outset, the pathway encourages gradual implementation through manageable pilot actions that can later be scaled institutionally. This approach aligns with international recommendations on whole-institution sustainability transformation and competence-based sustainability education (see Figure 1).

Figure 1
Recommended sequence



This pathway is particularly useful for:

- pilot initiatives;

- early-stage institutional engagement;
- departments with limited capacity;
- institutions facing resistance or uncertainty.

Deep-Dive Pathway

The Deep-Dive Pathway (see Figure 2) supports institutions in undertaking comprehensive, long-term sustainability transformation through the systemic integration of sustainability across teaching and learning, curriculum design, assessment, institutional governance, community engagement, partnerships, and organizational culture. Rooted in a whole-institution approach, it enables institutions to move beyond isolated initiatives toward embedded and lasting change.

This pathway is suitable for:

- institutional sustainability strategies;
- accreditation reform;
- national or consortium-level initiatives;
- large-scale curriculum transformation projects.

Figure 2

A systemic pathway for institutions seeking long-term sustainability transformation across curriculum, governance, engagement, and institutional culture

Deep-dive pathway

For systemic and long-term transformation

1. **Programme-wide curriculum redesign**
   Redesign entire programmes to integrate sustainability competencies, outcomes and interdisciplinary approaches.
2. **Institutional governance alignment**
   Align policies, structures, resources and decision-making with institutional sustainability goals.
3. **Faculty development systems**
   Establish continuous professional learning, incentives and support systems for faculty transformation.
4. **Sustainability competence frameworks**
   Adopt or co-create institutional frameworks aligned with global standards, such as GreenComp, and local needs.
5. **Stakeholder ecosystems**
   Build long-term partnerships with communities, NGOs, industry, government and youth networks.
6. **Monitoring and evaluation structures**
   Implement indicators, data systems and regular evaluation to track impact and guide continuous improvement.
7. **Whole-institution sustainability integration**
   Embed sustainability across learning, research, operations and engagement for lasting institutional transformation.

Move beyond pilots and projects towards structural change and measurable impact.

The manual can be read sequentially or used modularly. Each section contains:

- conceptual guidance;
- practical examples;
- implementation steps;
- templates and tools;
- reflective questions;
- adaptable models.

The intention is not to prescribe a single route, but to support institutions in building context-sensitive, participatory, and sustainable transformation processes.

The GREEN LEAF Model in Practice

The GREEN LEAF Model provides a practical and systemic framework for embedding sustainability within higher education curricula and institutional practice. Developed through the GREENUS project, the framework responds to a growing recognition that sustainability cannot be addressed through isolated courses or symbolic institutional commitments alone. Instead, meaningful curriculum greening requires coordinated transformation across learning processes, stakeholder relationships, institutional structures, and real-world action.

The model is organized around three interconnected pillars — **Learning, Engagement, and Action (LEAF)** — which together create an integrated ecosystem for sustainability transformation in higher education. Rather than functioning as separate dimensions, the pillars continuously interact and reinforce one another, supporting institutions in moving from fragmented initiatives toward systemic and long-term change.

Figure 3
The GREEN LEAF Framework wheel



GREEN LEAF Framework

An integrated system comprising Learning, Engagement and Action for systemic curriculum transformation. The wheel connects implementation steps with their supporting conditions.

1 / Learning

1. Define and systemise outcomes
Systems and spiral curriculum

2. Transformative pedagogies
Climate justice and Indigenous knowledge

3. Green learning environments
Experiential learning and co-creation

4. Holistic assessment
Authentic and competence-based assessment

2 / Engagement

1. Empower educators
Capacity building

2. Build partnerships
Stakeholder co-design

3. Activate ambassadors
Distributed leadership

4. Institutionalise governance
Governance integration

3 / Action

1. Implement evidence-based models
Campus-as-lab

2. Deploy implementation tools
Digital and toolkit infrastructure

3. Monitor and evaluate
Indicator and audit systems

4. Scale and improve
Accreditation and policy alignment

The Three Pillars of the GREEN LEAF Model

Learning

The Learning pillar focuses on transforming teaching, curriculum design, assessment, and learning environments in ways that develop sustainability competences and empower learners to respond to complex environmental, social, economic, and ethical challenges. This pillar emphasizes that sustainability education is not limited to disciplinary content alone, but includes the development of systems thinking, futures thinking, ethical reasoning, collaboration, agency, and action competence.

The Learning pillar supports institutions in:

- defining sustainability learning outcomes;
- integrating sustainability themes across disciplines;
- adopting transformative pedagogies;
- creating experiential and community-connected learning opportunities;
- aligning assessment with sustainability competences.

This pillar reflects international frameworks such as UNESCO's Greening Curriculum Guidance and the European GreenComp framework, both of which emphasize competence-based, interdisciplinary, and action-oriented sustainability learning.

Engagement

The Engagement pillar recognizes that curriculum greening cannot be achieved by educators working in isolation. Sustainability learning is strengthened through collaboration among students, faculty, institutional leaders, NGOs, industry, policymakers, local communities, and civil society actors. The Engagement pillar therefore focuses on building institutional and external ecosystems that support co-creation, participation, peer learning, and shared responsibility for sustainability transformation.

This pillar includes:

- faculty development and capacity-building;
- strategic stakeholder partnerships;
- communities of practice;
- challenge-based and community-based learning;
- networks of Green Learning Ambassadors;
- participatory governance and collaboration structures.

The Engagement pillar positions universities not only as knowledge providers, but also as active participants in local and global sustainability ecosystems.

Action

The Action pillar focuses on implementation, institutional alignment, monitoring, and long-term transformation. It ensures that sustainability becomes embedded within institutional structures, policies, governance systems, evaluation processes, and organizational culture rather than remaining limited to individual projects or temporary initiatives.

This pillar supports:

- alignment between curriculum and institutional sustainability strategies;

- governance integration;
- sustainability indicators and quality assurance;
- impact monitoring and evaluation;
- institutional learning and continuous improvement;
- scaling and institutionalization of successful practices.

The Action pillar reflects the understanding that sustainability transformation requires institutional commitment, leadership support, and mechanisms for continuity and accountability.

How the Pillars Interact

The three pillars are intentionally interconnected and mutually reinforcing. Effective curriculum greening emerges through the interaction between transformative learning experiences, collaborative engagement structures, and institutional action mechanisms.

For example:

- sustainability learning outcomes become more meaningful when developed with external stakeholders and connected to real societal challenges;
- transformative pedagogies become more effective when supported by faculty development and institutional recognition systems;
- community partnerships generate authentic learning opportunities while also strengthening institutional sustainability strategies;
- assessment and evaluation processes help institutions monitor progress and continuously improve curriculum greening efforts.

The LEAF model therefore conceptualizes curriculum greening as a dynamic and iterative process rather than a linear reform initiative. Institutions may begin at different entry points depending on their capacities, priorities, and contexts, but long-term transformation requires gradual integration across all three pillars.

What Counts as Curriculum Greening?

The GREEN LEAF Model recognizes that curriculum greening exists along a continuum. Institutions differ significantly in resources, governance structures, disciplinary traditions, and institutional readiness. For this reason, the framework distinguishes between minimum and advanced levels of curriculum greening.

Minimum-Level Greening

Minimum-level greening typically includes:

- introducing sustainability topics into one or more courses;
- defining a limited number of sustainability-related learning outcomes;
- integrating isolated sustainability assignments or activities;
- piloting individual pedagogical innovations;

- involving selected stakeholders in learning activities.

At this level, greening is often educator-driven and localized within specific modules or programmes.

Advanced-Level Greening

Advanced-level greening involves:

- programme-wide or institution-wide sustainability integration;
- alignment between curriculum, governance, and institutional strategy;
- competence-based sustainability frameworks;
- interdisciplinary and systems-oriented learning;
- transformative and experiential pedagogies;
- structured stakeholder ecosystems and partnerships;
- institutional monitoring and quality assurance systems;
- continuous professional development and faculty support structures;
- embedded sustainability culture across the institution.

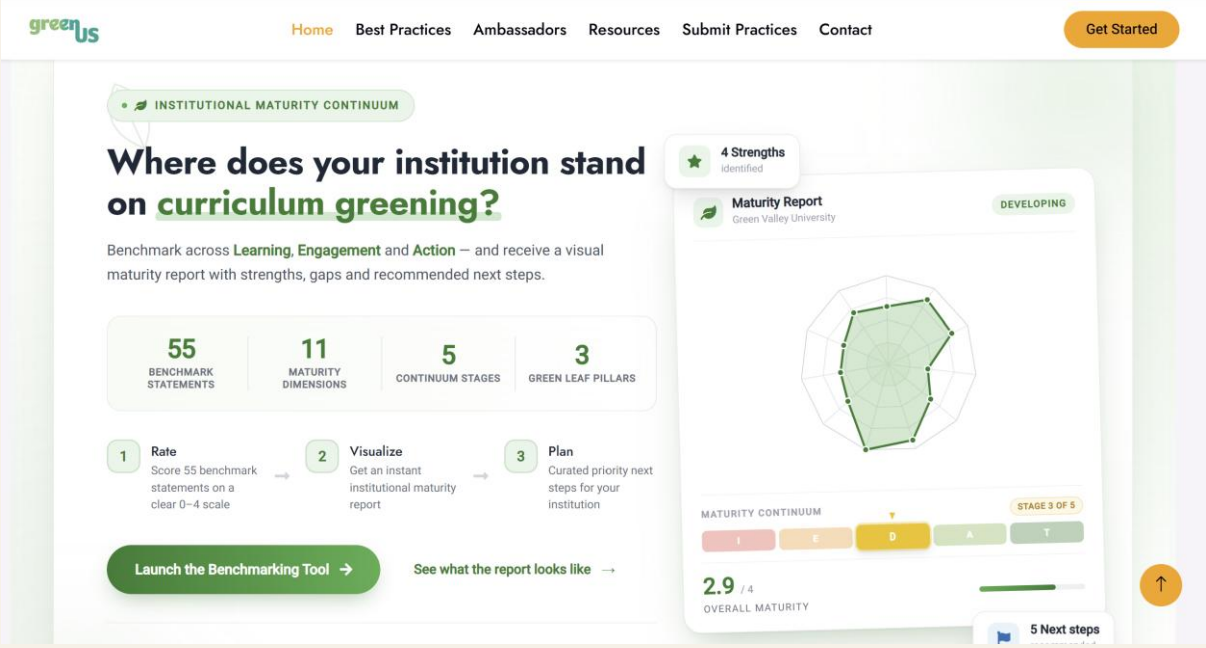
At this level, sustainability becomes part of institutional identity, decision-making, and long-term strategic development rather than an additional curricular component.

Curriculum Greening Benchmarking Tool

Purpose

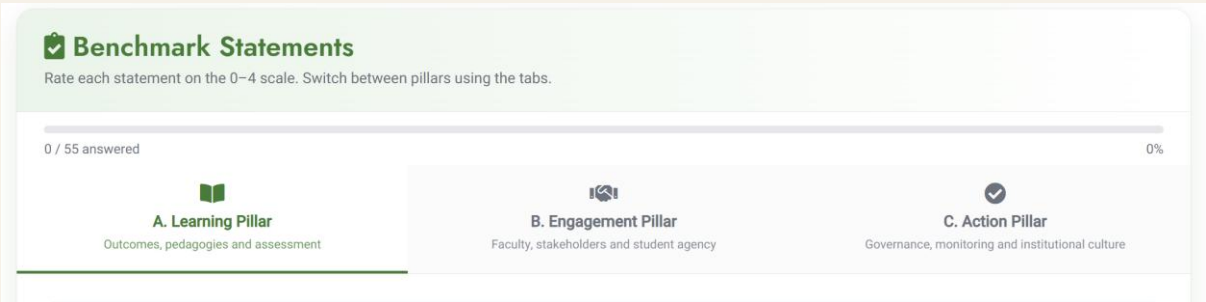
The GREEN LEAF tool is a reflective framework designed to help higher education institutions (HEIs) evaluate their current level of **sustainability integration**. Unlike a compliance-based audit, this tool is intended to foster **institutional dialogue, reflection, and continuous improvement**. It focuses on whole-institution approaches, transformative learning, and sustainability competence development.

Visit https://greenus.upb.ro/ to start the institutional assessment.



Framework Structure: The Three Pillars

The benchmarking framework is organized into three interconnected pillars, comprising **11 dimensions** and **55 specific benchmark statements**.



Pillar A: Learning

This pillar focuses on the core educational mission of the institution:

- **Sustainability Learning Outcomes:** Explicitly defining knowledge, skills, values, and agency, aligned with frameworks like **GreenComp**, and including systems thinking and ethics.
- **Curriculum Integration:** Mapping sustainability entry points across multiple disciplines and ensuring integration in compulsory courses, not just electives.
- **Pedagogy and Learning Design:** Utilizing experiential, problem-based, and community-based learning that engages students with real-world challenges.
- **Assessment Alignment:** Using reflective and action-oriented methods to evaluate **sustainability competences** rather than just content recall.

Pillar B: Engagement

This pillar examines how the institution interacts with its internal and external communities:

- **Faculty Development:** Providing pedagogical support, peer learning communities, and institutional incentives for educators.
- **Stakeholder Partnerships:** Collaborating with NGOs, industry, and municipalities to integrate community-based projects and practitioner insights into the curriculum.
- **Student Engagement and Agency:** Supporting **student-led projects**, leadership roles, and involving students in decision-making or co-creation processes.
- **Institutional Collaboration Ecosystem:** Coordinating initiatives across departments and maintaining active **communities of practice**.

Pillar C: Action

This pillar addresses the institutional structures and culture that sustain greening efforts:

Governance and Institutional Alignment: Embedding sustainability into the **institutional strategy** and quality assurance processes with active leadership support.

Monitoring and Evaluation: Systematically collecting feedback and monitoring progress against defined sustainability indicators to inform curriculum improvement.

Institutional Culture and Practice: Ensuring sustainability is visible in communication and that **campus operations** consistently model sustainable practices.

Assessment Methodology

Scoring Scale

Each of the 55 statements is rated on a **0–4 maturity scale**:

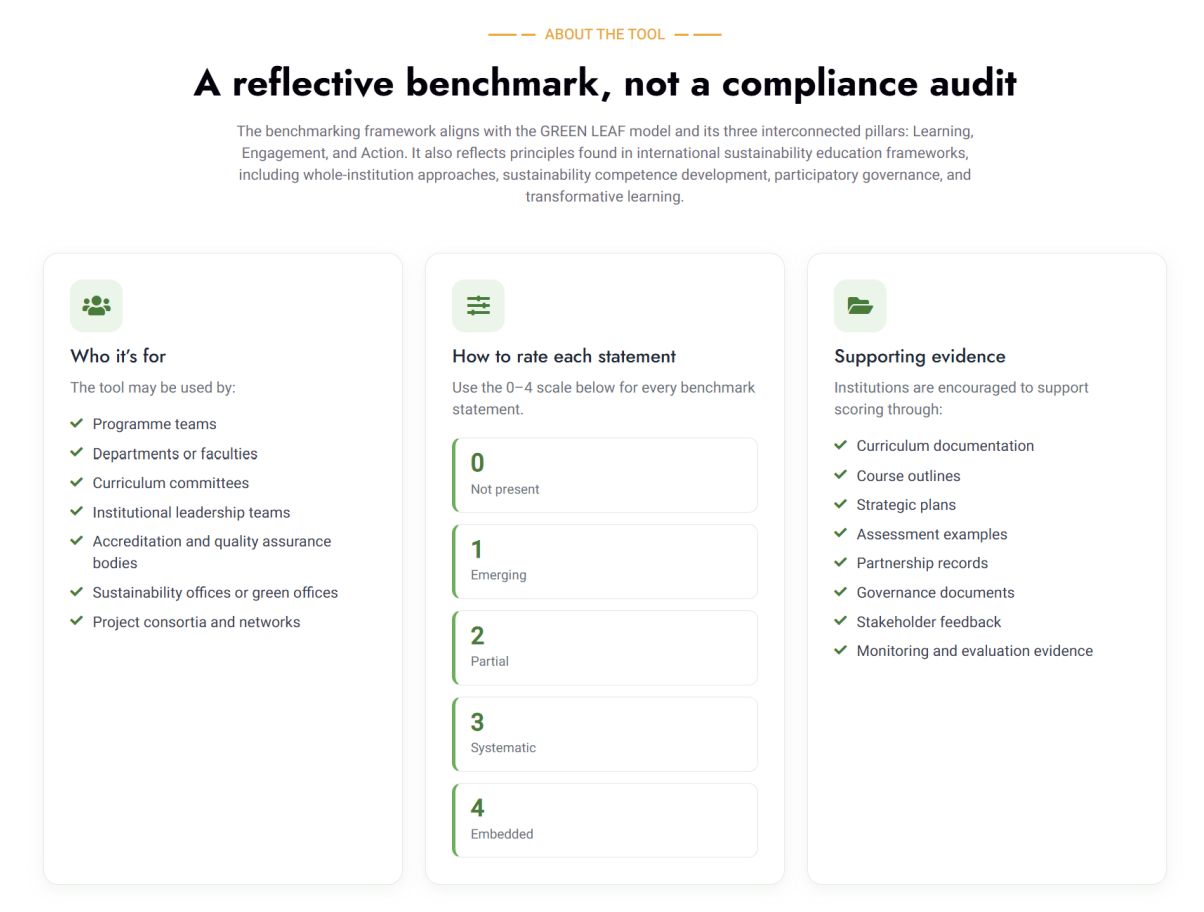
0 – Not present: The element is completely missing.

1 – Emerging: Early-stage awareness or isolated initiatives.

2 – Partial: Some integration but lacks full coordination.

3 – Systematic: Coordinated implementation across the institution.

4 – Embedded: Sustainability is a core, permanent feature of the practice.



Supporting Evidence

To ensure an objective assessment, institutions are encouraged to document their scores with evidence such as:

- Strategic plans and governance documents.
- Course outlines and curriculum mapping documentation.
- Records of partnerships and stakeholder feedback.
- Monitoring reports and assessment examples.

Interpreting the Institutional Maturity Continuum

Upon completion, the tool generates a **Visual Maturity Report**. The overall score (out of 4.0) determines the institution's position on the **Maturity Continuum**:

1 – INITIAL (0.00 – 0.79): Minimal activity; sustainability is not yet a strategic priority.

2 – EMERGING (0.80 – 1.59): Awareness is growing, but integration remains limited.

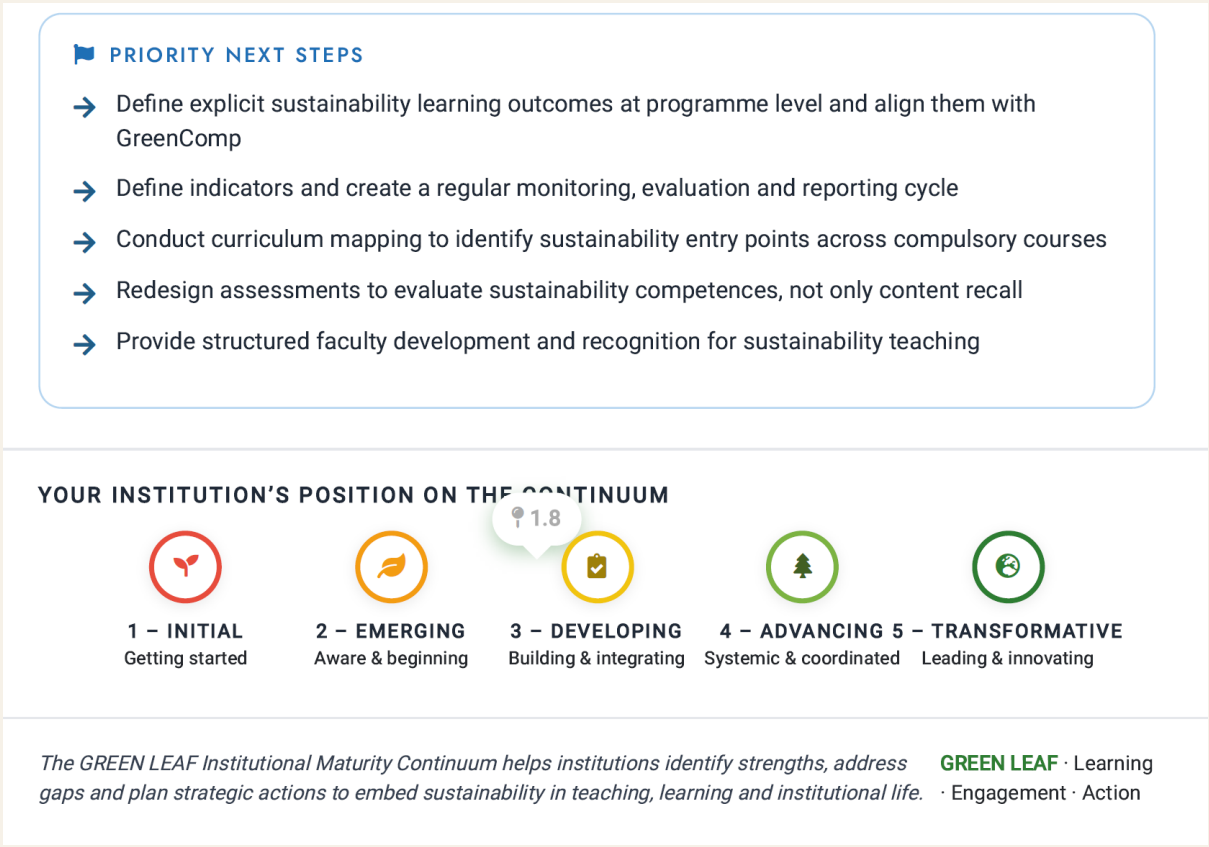
3 – DEVELOPING (1.60 – 2.39): Building and integrating; initiatives are coordinated and systems are emerging.

4 – ADVANCING (2.40 – 3.19): Strong, systemic integration with established partnerships.

5 – TRANSFORMATIVE (3.20 – 4.00): Leading and innovating; sustainability is fully embedded in all policies, practices, and institutional culture.

5. Actionable Outputs

The final report does more than provide a score; it highlights **Key Strengths**, identifies **Key Gaps**, and suggests **Priority Next Steps**. This output is designed to be used by leadership teams, curriculum committees, and sustainability offices to plan strategic actions and move the institution toward the "Transformative" stage of the continuum



Designing a green curriculum

01 Define Sustainability Learning Outcomes

Purpose

The first and perhaps most important step in designing a green curriculum is defining sustainability learning outcomes. This step transforms sustainability from a broad institutional aspiration into a concrete educational commitment that shapes teaching, learning, assessment, and learner development.

Many institutions today include sustainability within their strategic plans, mission statements, or public commitments. However, sustainability often remains weakly operationalized within actual curricula. It appears as an isolated lecture, an optional topic, or an extracurricular activity rather than as a meaningful dimension of learning embedded throughout programs and disciplines. As a result, learners may graduate with technical expertise in their field but without the competences necessary to understand complexity, navigate uncertainty, address ethical dilemmas, collaborate across sectors, or contribute meaningfully to sustainability transitions.

THIS SECTION / LEARNING PILLAR



Defining sustainability learning outcomes addresses this gap. It helps institutions clarify what learners should know, value, critically reflect upon, and ultimately be capable of doing in relation to sustainability challenges.

Within the GREEN LEAF framework, sustainability learning outcomes are understood as integrated expressions of:

- knowledge,
- practical and cognitive skills,
- values and ethical orientations,
- and learner agency.

This process aligns with international frameworks such as the European GreenComp framework (Bianchi et al., 2022), which conceptualizes sustainability competence as the integration of knowledge, skills, attitudes, and agency for acting responsibly toward the planet and society. GreenComp organizes sustainability competences into four interconnected areas (see Figure 4):

Figure 4
GreenComp Areas and Competences



Similarly, UNESCO's Greening Curriculum Guidance emphasizes that sustainability education should integrate (Figure 5):

Figure 5
Three dimensions of sustainability competence



Within the GREEN LEAF framework, sustainability learning outcomes are therefore not limited to environmental literacy. They aim to foster cognitive mastery, socio-emotional orientation, and green behavioral agency (Figure 6):

Figure 6
Iterative Sustainability Competence Development Model



Learning outcomes are specific statements describing what learners are expected to know, understand, value, and be able to do at the end of a learning process. They are formulated in observable and measurable terms and reflect the integration of knowledge, skills, responsibility, autonomy, values, and action competences that can be demonstrated and assessed in authentic learning, professional, or community contexts. In sustainability-oriented education, learning outcomes should support critical and reflective thinking, transformative learning, and the ability to apply disciplinary knowledge to real-world sustainability challenges.

A well-designed sustainability learning outcome should clearly define what learners are expected to know, value, and be able to do in relation to sustainability challenges. It should be measurable, action-oriented, and connected to disciplinary knowledge, while supporting critical thinking, ethical reflection, and transformative learning (**Figure 7**).

Figure 7
Principles for sustainable learning outcomes

Writing sustainability learning outcomes

01 Be measurable and observable

Use clear, specific and observable action verbs that show what learners can do.

02 Connect sustainability to disciplinary knowledge

Embed sustainability in the concepts, methods and real-world challenges of the discipline.

03 Integrate values and action dimensions

Include ethical values, responsibility and the capacity to act for change.

04 Encourage critical and reflective thinking

Promote analysis, questioning, perspective-taking and reflection on complex sustainability issues.

05 Support transformative learning experiences

Design outcomes that foster mindset shifts, empowerment and meaningful learning in real contexts.

06 Align with authentic assessment methods

Ensure outcomes can be assessed through real-world tasks, projects and portfolio evidence.

Core Principles for Writing Sustainability Learning Outcomes

What Are Sustainability Learning Outcomes?

As discussed throughout this guidebook, curriculum greening requires moving beyond the inclusion of sustainability topics toward the intentional development of sustainability competences. This shift places learners at the center of curriculum design and encourages educators to define what learners should know, understand, value, and be able to do in response to sustainability challenges.

A learning outcomes approach supports this transformation by making educational intentions explicit and learner-centered. Instead of describing what educators intend to teach, sustainability learning outcomes describe what learners are expected to achieve by the end of a course, module, program, or learning experience.

The importance of clear and meaningful learning outcomes has long been emphasized in educational research. Robert Mager argued that educational intentions should be stated in ways that communicate expectations accurately and minimize ambiguity. Well-formulated learning outcomes describe observable learner performance so clearly that different educators can interpret and assess them consistently.

Within the context of sustainability education, this clarity becomes particularly important because sustainability involves complex combinations of knowledge, values, skills, attitudes, and action. Poorly formulated outcomes can result in superficial sustainability integration, whereas clear outcomes help ensure coherence between curriculum design, teaching methods, learning activities, and assessment.

For the purposes of the GREEN LEAF framework, sustainability learning outcomes can be defined as (see):

Box 1
What are learning outcomes

Specific statements describing what learners are expected to know, understand, value, and be able to do in relation to sustainability challenges at the end of a learning process. They are formulated in terms of knowledge, skills, responsibility, autonomy, values, and agency, and can be demonstrated and assessed in authentic academic, professional, civic, or community contexts.

Figure 8
Learning outcomes



Source: Adapted from Manasia and Negreanu (2024)

The definitions and descriptions of learning outcomes used in qualifications frameworks, qualification standards, and study programmes are statements about intended outcomes. They do not represent actual learning outcomes, but rather **desired targets**. Actual learning outcomes can only be identified

after the learning process has been completed, through assessment and the demonstration of acquired competences in real-life situations, for example in the workplace.

How Does the Concept of Learning Outcomes Differ from Learning Aims and Learning Objectives?

When designing a course or study programme, it is important to distinguish between **learning aims**, **learning objectives**, and **learning outcomes**. Confusion between these concepts can reduce the clarity of educational intentions and create uncertainty regarding what learners are expected to achieve.

A **learning aim** (or general objective) of a module, course, or programme is a broad statement describing the overall teaching intention. It indicates what the educator intends to cover within a particular learning experience and provides the general direction of the content. Learning aims are typically written from the instructor's perspective and have a broad scope. For example:

> ***This course aims to provide an introduction to research methods in the field of…***

A **learning objective** is a more specific statement of teaching intention, identifying a particular area that the educator intends to address within a learning sequence. For example:

> ***Students will become familiar with the impact of human behaviours and lifestyles on local and global environments.***

The key difference lies in the level of specificity: a learning aim provides the overall direction, whereas learning objectives offer more detailed information about what the teaching process seeks to accomplish.

Thus, learning aims provide a general orientation regarding the content to be taught, while learning objectives identify more specific areas of focus within a course or module (European Commission, Directorate-General for Education and Culture, 2011; Kennedy et al., 2006).

A common source of confusion is that learning objectives may be formulated either in terms of *teaching intentions* (a teacher-centred approach) or *expected learning* (a learner-centred approach). This inconsistency means that, in some cases, objectives describe the activities of the teacher, while in others they describe student performance. Moon (2002) argues that this ambiguity justifies avoiding the term *objective* altogether when describing modules or programmes, as it can blur the distinction between teaching intentions and learning achievements.

Learning outcomes, by contrast, are explicit statements of what learners are expected to achieve and demonstrate by the end of a learning experience. They describe not only what learners should know and understand, but also how they can demonstrate these achievements in relevant assessment contexts. Unlike aims and objectives, learning outcomes focus on what the learner is capable of doing rather than on what the educator intends to teach.

Another important distinction concerns the actor performing the activity. Learning aims and objectives generally describe what a teacher, programme, or institution intends to do, whereas learning outcomes describe, in observable and measurable terms, what learners are able to do upon completion of a learning experience, such as a course, project, or module.

Compared with objectives, learning outcomes are more precise, easier to formulate, and clearer for all stakeholders, including educators, students, employers, and accreditation bodies. They also function as a common language that supports transparency and comparability across courses and programmes,

both nationally and internationally. This is particularly important in the context of educational internationalization and the European Qualifications Framework (EQF).

Box 2
Similarities and Differences Between Learning Objectives and Learning Outcomes

To support Moon's (2002) argument, it is useful to consider the ISCED definition of learning objectives:

Learning objectives refer to the specification of outcomes to be achieved upon completion of a learning activity. These include the acquisition or improvement of knowledge, skills, and competences in personal, civic, social, or professional contexts (UNESCO Institute for Statistics, 2012, p. 81).

Consequently, there is not always a strict distinction between objectives and learning outcomes. In some cases, objectives may be formulated as learning outcomes (European Commission, Directorate-General for Education and Culture, 2011).

For example, the intention:

To familiarize students with the conditions necessary for cultivating roses from plant samples

can be reformulated as a learning outcome:

By the end of the course, students will be able to use plant samples to cultivate roses under different environmental conditions.

Both statements can be further elaborated by specifying the skills and competences learners are expected to develop.

In practice, however, learning objectives are generally written from the teacher's perspective, whereas learning outcomes are formulated in a way that is easily understood by both educators and learners. Learning outcomes describe what students can actually do after the learning process, while objectives provide guidance for the teaching process, which may or may not lead to the desired outcomes.

Example of a Learning Objective

To analyse discipline-related challenges in primary education, taking into account the causes of disruptive behaviour and strategies for maintaining classroom management and discipline.

Example of a Learning Outcome

By the end of the module, students will be able to explain the most common causes of disruptive behaviour among primary school pupils and identify appropriate methods and techniques for addressing such behaviour (European Commission, Directorate-General for Education and Culture, 2011, p. 14).

Recommendations for Writing Sustainability Learning Outcomes

Sustainability learning outcomes should be formulated in ways that clearly communicate what learners are expected to achieve and demonstrate by the end of a learning experience. Well-written learning outcomes support curriculum coherence, guide teaching and assessment, and help learners understand the competences they are expected to develop.

When formulating sustainability learning outcomes, it is recommended that they:

- *Be introduced with a learner-centred statement*, such as: *By the successful completion of this course/module, learners will be able to…*

- *Begin with an action verb* and describe a knowledge, skill, value, or agency-related competence that can be observed and assessed.
- *Focus on demonstrable achievement*, specifying what learners should be capable of doing rather than what educators intend to teach.
- *Be measurable and assessable*, ensuring that achievement can be evidenced through appropriate assessment methods.
- *Be expressed in clear and concise language*, avoiding unnecessarily complex sentence structures.
- *Use terminology that is accessible to diverse stakeholders*, including learners, educators, curriculum developers, accreditation bodies, employers, and community partners.
- *Avoid vague or ambiguous verbs*, such as *know*, *understand*, *be aware of*, or *be familiar with*, unless they are accompanied by observable performance indicators.
- *Go beyond knowledge acquisition*, incorporating higher-order cognitive processes such as application, analysis, evaluation, creation, reflection, and action.
- *Be written at an appropriate level of specificity*:
    - broader and more integrative at programme level;
    - more detailed and context-specific at course or module level.
- *Include integrated sustainability competences whenever possible*, combining knowledge, skills, values, and action.

Because sustainability education aims to develop transformative competences rather than merely transmit information, learning outcomes should also:

- Incorporate systems thinking, encouraging learners to identify relationships, interdependencies, and unintended consequences.
- Address ethical and justice dimensions, including equity, inclusion, responsibility, and environmental justice.
- Promote futures-oriented thinking, helping learners anticipate alternative futures and evaluate long-term implications of decisions.
- Foster learner agency, encouraging participation, collaboration, leadership, and action for sustainability.
- Connect sustainability to disciplinary and professional practice, ensuring relevance within specific fields of study.
- Support transformative learning, encouraging critical reflection on assumptions, values, and societal structures.

The formulation of learning outcomes should follow a structured approach that incorporates the key principles summarized in Table 1.

Table 1

Basic Structure for Formulating Sustainability Learning Outcomes

Addresses the Learner	Uses an Action Verb	Specifies the Sustainability Knowledge, Skill, Value, or Agency Dimension	Clarifies the Sustainability Context
Examples			

Addresses the Learner	Uses an Action Verb	Specifies the Sustainability Knowledge, Skill, Value, or Agency Dimension	Clarifies the Sustainability Context
Learner/ Student …	…is expected to…	…demonstrating sustainability-related learning…	…within the context of…
Student …	is expected to evaluate…	the environmental, social, and economic impacts of alternative energy solutions…	in relation to sustainable development and climate action goals.
Student …	is expected to design…	sustainability-oriented interventions for reducing resource consumption…	within institutional or community settings.
Student …	is expected to justify…	decisions using ethical and sustainability principles…	in professional and societal contexts.

Source: Cedefop (Cedefop, 2022, p. 79)

The formulation of sustainability learning outcomes should capture both the **depth** and the **complexity** of learning. Sustainability education goes beyond the acquisition of knowledge; it seeks to develop learners' ability to analyse complex systems, navigate uncertainty, engage with ethical dilemmas, collaborate with diverse stakeholders, and contribute to sustainable futures. As a result, sustainability learning outcomes should clearly communicate not only *what* learners are expected to learn, but also the level of cognitive, ethical, and practical engagement required.

Developing meaningful sustainability learning outcomes therefore requires attention to both a **vertical** and a **horizontal** dimension.

The **vertical dimension** refers to the level and complexity of learning expected from learners. This dimension is often reflected through the choice of action verbs, which signal whether learners are expected to identify, explain, analyse, evaluate, design, or implement sustainability-related solutions. However, action verbs alone are insufficient. To communicate the intended level of learning effectively, they must be accompanied by a clear description of the learning focus and the context in which the competence will be demonstrated.

The **horizontal dimension** refers to the breadth and applicability of the learning outcome. It specifies the sustainability challenge, disciplinary domain, professional context, or societal setting in which learners are expected to apply their knowledge, skills, values, and agency.

Together, these two dimensions help ensure that sustainability learning outcomes are meaningful, measurable, and relevant to real-world sustainability challenges.

A well-formulated sustainability learning outcome typically includes five key components:

1. **Learning Context or Condition:** Specifies when or under what conditions the outcome is expected to be achieved.

Example:

By the successful completion of the course *Sustainable Urban Development*...

2. **Learner Reference:** Identifies the person who will demonstrate the learning.

Example:

Students will be able to...

3. **Action Verb:** Describes the observable and assessable behaviour learners are expected to demonstrate.

Examples:

analyse, evaluate, design, justify, prototype, implement

4. **Object of Learning:** Specifies the knowledge, skill, value, or sustainability issue that is the focus of the action.

Example:

...evaluate the environmental and social impacts of urban mobility systems...

5. **Context of Application:** Defines the disciplinary, professional, civic, or societal context in which the competence will be demonstrated.

Example:

...within the context of sustainable city planning and climate adaptation.

Box 3
Example of a Well-Formulated Sustainability Learning Outcome

By the successful completion of the course, students will be able to evaluate the environmental, social, and economic impacts of urban mobility systems in the context of sustainable city planning and climate adaptation.

This formulation clearly identifies:

- the learner;
- the expected action;
- the sustainability focus;
- and the context of application.

One of the most common challenges in curriculum design is distinguishing between vague statements of intent and precise learning outcomes (see Table 2). Ambiguous formulations often describe teaching activities or broad aspirations rather than observable learner achievements. They frequently rely on verbs such as *know*, *understand*, *be aware of*, *learn about*, or *be familiar with*, which are difficult to assess objectively.

Table 2

Examples of vague and ambiguous vs. clear and achievable learning outcomes

Vague and ambiguous formulation	Clear and Achievable Formulation
Students will become familiar with the concept of smart cities. *Comment: The expected level of achievement is unclear.*	By the end of the semester, students who successfully complete the course will be able to identify and describe at least five smart technologies used in the development and management of smart cities, including applications in areas such as urban mobility, energy efficiency, and resource management, based on field-based investigation and the development of a practical implementation guide.
Students will be taught different decision-making models. *Comment: Teacher-centred formulation; the expected level of cognitive complexity is unclear.*	By the end of the semester, students who successfully complete the course will be able to apply appropriate decision-making models to business and marketing scenarios through participation in a collaborative group project.
Students will learn about research designs. *Comment: Ambiguous; the expected level of cognitive complexity is unclear.*	By the end of the semester, students will be able to independently develop a research proposal, including a literature review, research design, methodology, expected results, ethical considerations, and study limitations, addressing a STEM-related issue relevant to secondary education.

A common pitfall in sustainability education is focusing exclusively on awareness-raising. While awareness is important, sustainability learning outcomes should ideally extend beyond understanding and encourage learners to develop the competences necessary to act.

For this reason, educators are encouraged to formulate outcomes that progressively move learners from:

- understanding sustainability issues,
- to analysing complex systems,
- to evaluating alternative futures,
- to designing solutions,
- and ultimately to taking informed and responsible action.

This progression reflects the broader goals of the GREEN LEAF framework, which seeks to develop sustainability knowledge, and values, agency, and transformative capacity. Effective sustainability learning outcomes therefore serve as a bridge between learning and action, helping learners become active contributors to sustainable and just futures.

02 Map Existing Courses

Constructive alignment

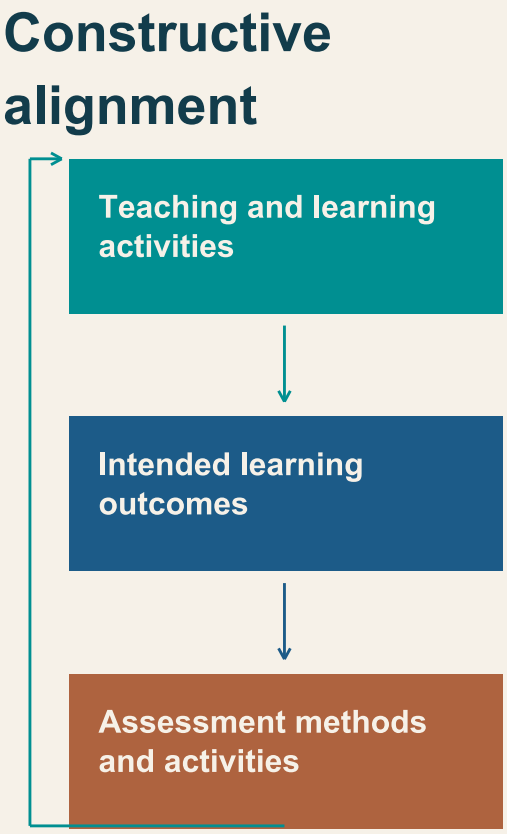
At the heart of curriculum design are three essential processes:

- defining clear and meaningful sustainability learning outcomes;
- designing teaching and learning activities that enable learners to develop and demonstrate these outcomes;
- selecting appropriate assessment methods through which learners can provide evidence of their achievement.

When these three elements are coherent and intentionally connected, they form what is known as **constructive alignment**. Constructive alignment ensures that sustainability learning outcomes, pedagogical approaches, learning activities, and assessment methods work together to support the development of sustainability competences. Rather than treating sustainability as an additional topic or isolated activity, constructive alignment embeds it throughout the learning process, creating a coherent pathway from intended learning to demonstrated competence. This relationship between sustainability learning outcomes, teaching and learning activities, and assessment is illustrated in Figure 9.

Figure 9

Constructive Alignment of Learning Outcomes with Teaching, Learning, and Assessment Activities



In an effective educational process, coherence between **learning outcomes**, **teaching and learning activities**, and **assessment methods** is essential. Constructive alignment, introduced by John Biggs (2003; Biggs & Tang, 2011), provides a framework for ensuring that these elements work together to support meaningful learning.

The concept combines constructivist learning theory—which views learners as active participants in the construction of knowledge—with the principle that all components of curriculum design should be aligned with the intended learning outcomes. As a result, learners engage in activities that help them achieve the expected outcomes and are assessed through methods that provide valid evidence of their achievement.

According to Biggs, implementing constructive alignment involves four key steps: (1) defining intended learning outcomes, (2) designing teaching and learning activities that support their achievement, (3) selecting appropriate assessment methods, and (4) ensuring continuous coherence between outcomes, learning activities, and assessment - Figure 10.

Figure 10

The Constructive Alignment Model Proposed by Biggs, Showing the Continuous Relationship Between Learning Outcomes, Teaching and Learning Activities, and Assessment



Constructive alignment should be ensured consistently across all levels of the educational process: at the programme level, across individual courses, and within each learning session (e.g., lectures, seminars, laboratories, or field-based activities). In the context of curriculum greening, this means ensuring that sustainability learning outcomes are progressively developed, reinforced, and assessed throughout the learner journey rather than being confined to isolated courses or activities.

To make this coherence visible, institutions often use curriculum mapping. Curriculum mapping is a systematic process through which educators and programme teams visually represent and analyse how programme-level learning outcomes are distributed across courses, modules, and learning experiences. It helps identify where sustainability competences are introduced, reinforced, and mastered, while also revealing strengths, gaps, overlaps, and opportunities for improvement.

Curriculum mapping

Curriculum mapping is understood as a systematic process used to visualize where and how learning outcomes are taught, developed, and assessed across a programme of study. It provides a structured

overview of the relationship between programme-level learning outcomes and the courses, modules, or learning experiences that contribute to their achievement.

Typically, curriculum mapping involves the creation of a matrix, often referred to as a **curriculum map**, in which programme learning outcomes (PLO) are positioned along one axis and courses or modules along the other - Table 3. This approach makes it possible to examine whether each intended learning outcome is adequately addressed throughout the curriculum and to identify areas of strength, potential gaps, unnecessary duplication, or opportunities for improvement.

Table 3
Curriculum map

Courses/Modules	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7
Course 1							
Course 2							
Course 3							
Course 4							
Course 5							
...							
Course *n*							

Depending on the level of detail included, curriculum maps can take several forms, including **alignment maps**, **progression maps**, and **curriculum integration maps**.

The **alignment map** represents the simplest form of curriculum mapping. It indicates whether a particular course contributes to a given programme learning outcome, usually through a simple marker (e.g., an “X”). Its primary purpose is to reveal the direct relationship between courses and learning outcomes and to identify outcomes that may be insufficiently addressed or, conversely, courses that make little contribution to the overall programme profile. This type of map provides an initial overview of curriculum coherence.

The **progression map** (Table 4) offers a more detailed perspective by illustrating how learning outcomes develop throughout the curriculum. Rather than simply indicating whether a course addresses an outcome, it identifies the level at which the outcome is developed. Commonly used categories include **Introduced (I)**, **Developed (D)**, **Mastered (M)**, and, where relevant, **Assessed (A)**. This approach enables programme teams to verify that learning outcomes are introduced at appropriate points, progressively developed through multiple learning experiences, and formally assessed only after sufficient opportunities for practice and consolidation have been provided. Such maps are particularly valuable for ensuring a logical and progressive pathway for sustainability competence development across a programme.

Table 4

Progression map

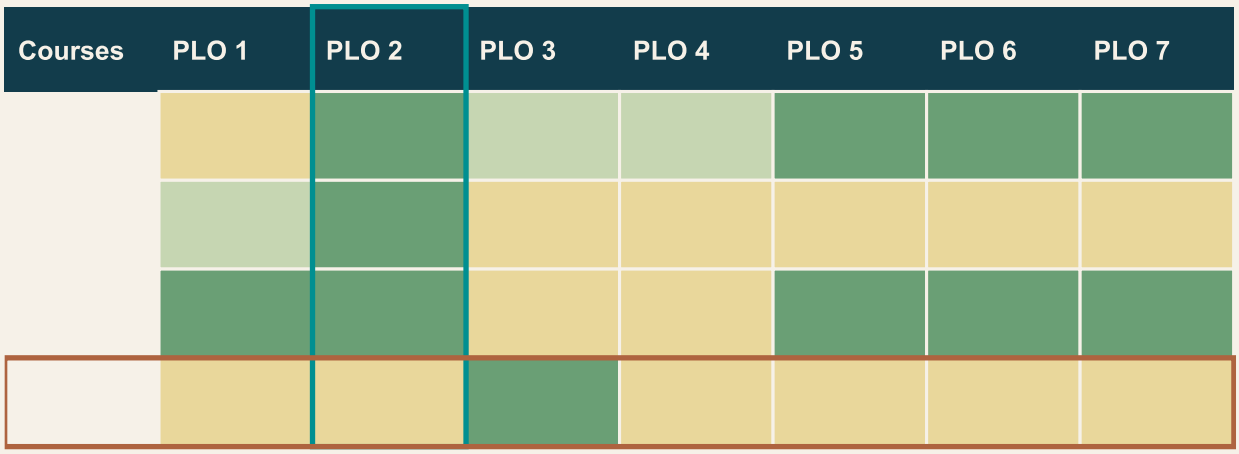
Course / Learning Experience	PLO 1	PLO 2	PLO 3	PLO 4
Course 1 (Introduction to the Discipline)	I	I		
Course 2 (Intermediate Level)	Dx		I	Dx
Course 3 (Advanced Level)	A	M	M	A
…				
Applied Project / Capstone Project	M	A	A	M

The **curriculum integration map (**Table 5**)** focuses on the degree of emphasis given to each learning outcome across different courses or learning experiences. Rather than simply indicating whether an outcome is addressed or showing its level of progression, this type of map illustrates the extent to which a learning outcome is integrated within the curriculum. Common categories include *limited integration*, *moderate integration*, and *substantial integration.*

This approach allows programme teams to examine whether particular learning outcomes receive sufficient attention throughout the curriculum or, conversely, whether they are underrepresented relative to others. In the context of curriculum greening, integration maps can be particularly useful for assessing the visibility and prominence of sustainability learning outcomes across programmes, helping institutions identify areas where sustainability remains peripheral and where deeper integration may be needed.

Table 5

Example of a curriculum integration map



Note: Yellow indicates *limited integration*; light green indicates *moderate integration*; dark green indicates *substantial integration*.

While curriculum mapping is traditionally used to examine the alignment between courses and programme learning outcomes, it can also be used to analyse the integration of sustainability throughout a programme. In this case, courses are mapped against a set of sustainability metaconcepts that

represent the core dimensions of sustainability competence development. Mapping courses against these metaconcepts helps programme teams identify where sustainability is already embedded, where gaps exist, and whether learners are provided with sufficient opportunities to progressively develop sustainability competences throughout their studies. The resulting map provides a valuable basis for curriculum review, redesign, and quality enhancement, while supporting a more coherent and institution-wide approach to curriculum greening - Table 6.

Table 6

Course Mapping Matrix (Course × Sustainability Metaconcepts)

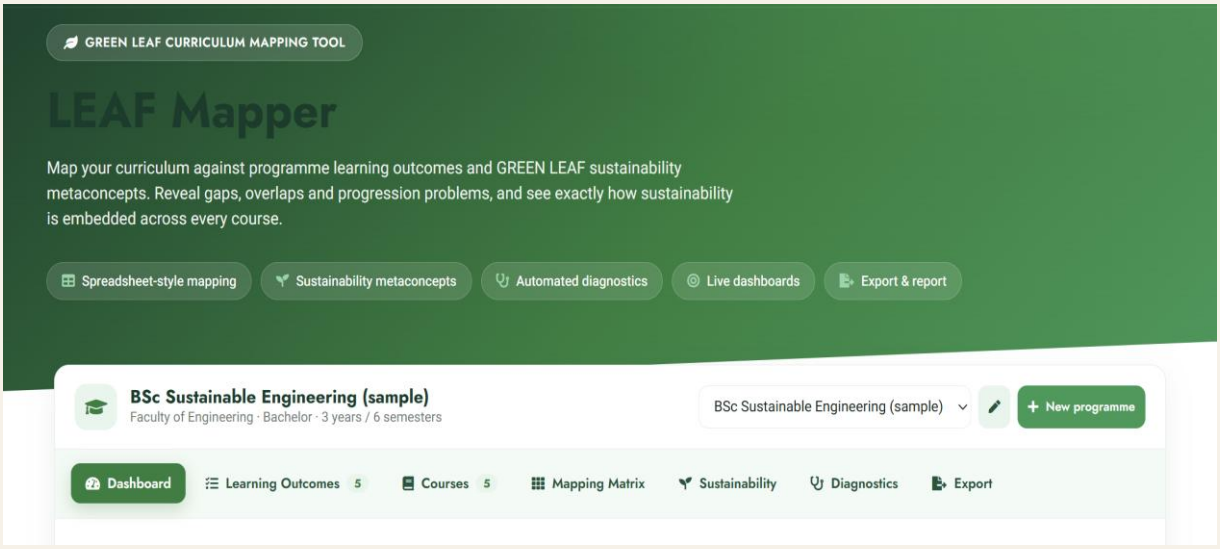
Course / Module	Systems	Futures	Values	Justice	Stakeholders	Action
Course 1	◍	◍	◍	◍	◍	◍
Course 2	◍	◍	◍	◍	◍	◍
Course 3	◍	◍	◍	◍	◍	◍
Course 4	◍	◍	◍	◍	◍	◍

The curriculum mapping process begins with the clear definition of programme-level learning outcomes, formulated in measurable terms and aligned with the intended level of study. Relevant courses, modules, and learning experiences are then identified and mapped against these outcomes within a curriculum matrix. The matrix indicates where outcomes are introduced, developed, reinforced, mastered, or assessed throughout the programme. This process helps visualize learning progression, identify gaps or overlaps, and ensure a coherent and transparent pathway for competence development across the curriculum (McCartin & Tocco, 2020).

LEAF Mapper: Curriculum Mapping Tool

The **LEAF Mapper** is a digital, spreadsheet-style tool designed to help programme teams visualize, analyse, and enhance the integration of sustainability across an entire curriculum. While the Benchmarking Tool evaluates institutional maturity, the LEAF Mapper provides a **granular, course-by-course analysis** to ensure that sustainability is a coherent pathway throughout the learner journey.

Visit the LEAF Mapper's page to start the mapping process.

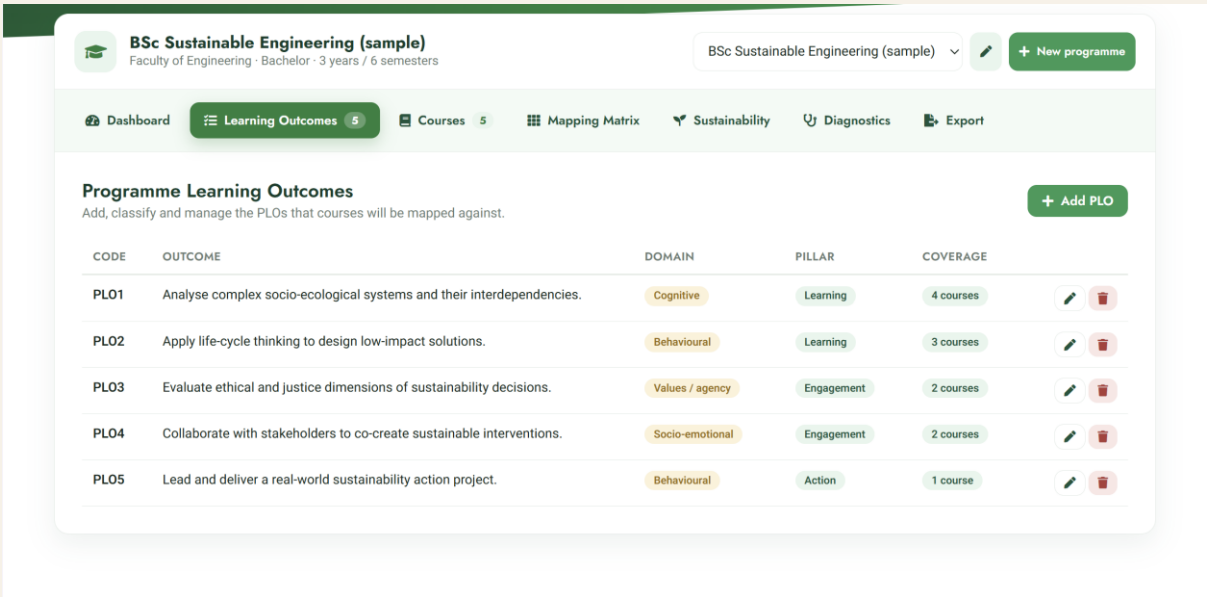


Purpose: Achieving Constructive Alignment

At the core of the LEAF Mapper is the principle of **constructive alignment**. For sustainability education to be effective, three elements must be intentionally connected:

- **Intended Learning Outcomes:** Defining what sustainability competences students should develop.
- **Teaching and Learning Activities:** Designing experiences (e.g., living labs, community-based learning) that enable students to develop these outcomes.
- **Assessment Methods:** Selecting methods that provide valid evidence of competence achievement.

The LEAF Mapper makes this alignment visible, helping educators identify where sustainability competences are introduced, reinforced, and mastered.



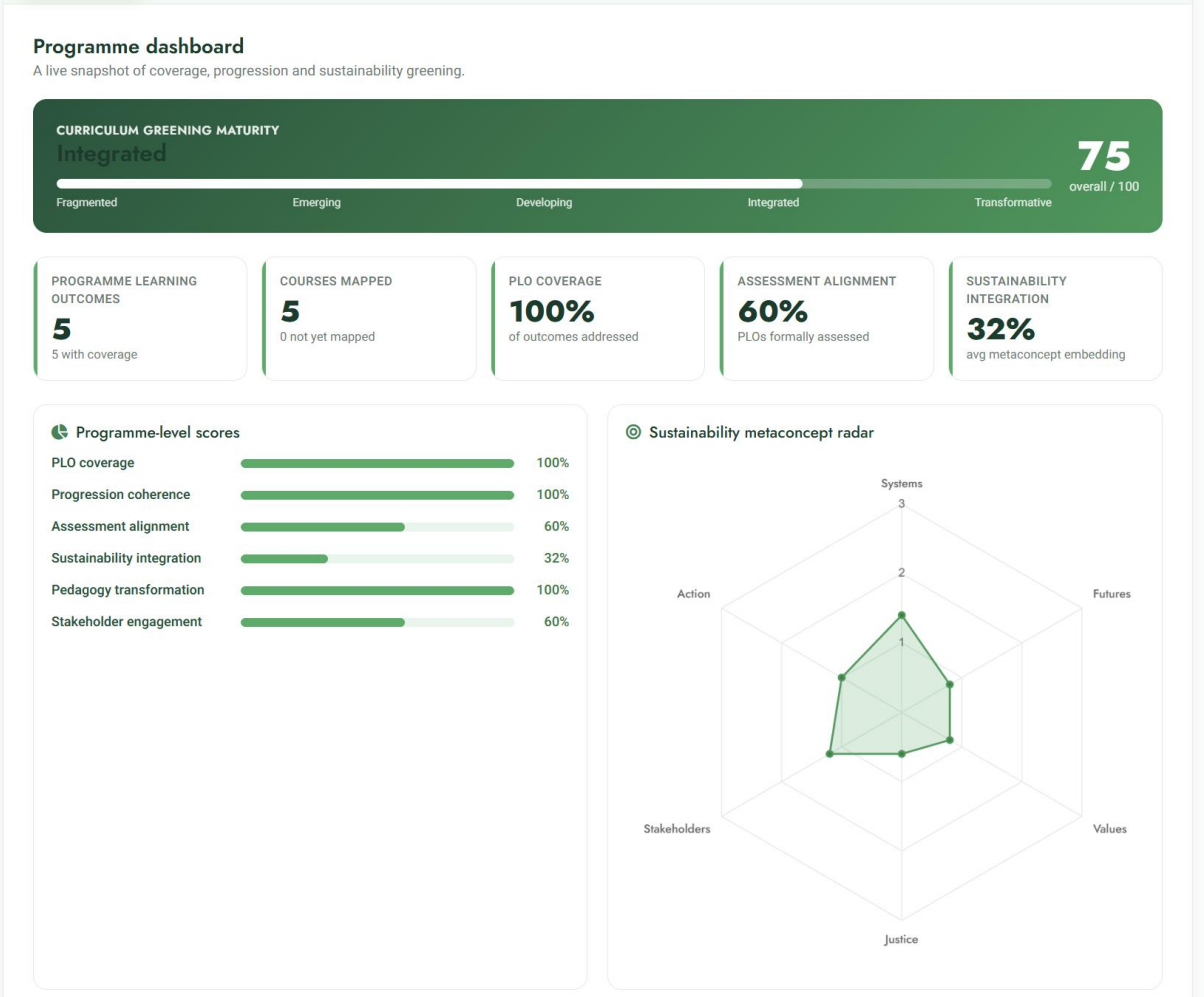
Multi-Dimensional Mapping Approaches

The tool allows users to switch between different map types to gain various perspectives on curriculum coherence:

- **Alignment Maps:** The simplest form, identifying which courses contribute to specific Programme Learning Outcomes (PLOs).
- **Progression Maps:** Illustrate how outcomes develop over time using categories such as *Introduced (I), Developed (D), Mastered (M), and Assessed (A).* This ensures students have sufficient practice before being formally assessed.
- **Integration Maps:** Focus on the degree of emphasis given to sustainability, categorising integration as *limited, moderate, or substantial*.
- **Sustainability Metaconcept Mapping:** A specialized matrix where courses are mapped against the core dimensions of sustainability competence: *Systems, Futures, Values, Justice, Stakeholders,* and *Action.*

Key Features and Functionality

- **Spreadsheet-Style Interface:** A user-friendly matrix for adding PLOs and capturing course data, including pedagogy and learning environments (Classroom, Digital, Community, Place-based, or Living Lab).
- **Live Dashboards:** A "Programme Dashboard" provides a real-time snapshot of PLO coverage, a *Sustainability Metaconcept Radar*, and an overall curriculum greening maturity score.



- **Automated Diagnostics:** The tool automatically checks for gaps (unaddressed outcomes), overlaps (unnecessary duplication), and progression problems within the curriculum.
- **Evidence-Based Recommendations:** Based on the mapping data, the tool generates live suggestions for improving curriculum coherence and sustainability integration.

How to Use the LEAF Mapper

Step 1: Define Programme Learning Outcomes (PLOs). Enter the specific sustainability-related outcomes the programme aims to achieve, classified by knowledge, skills, values, and agency.

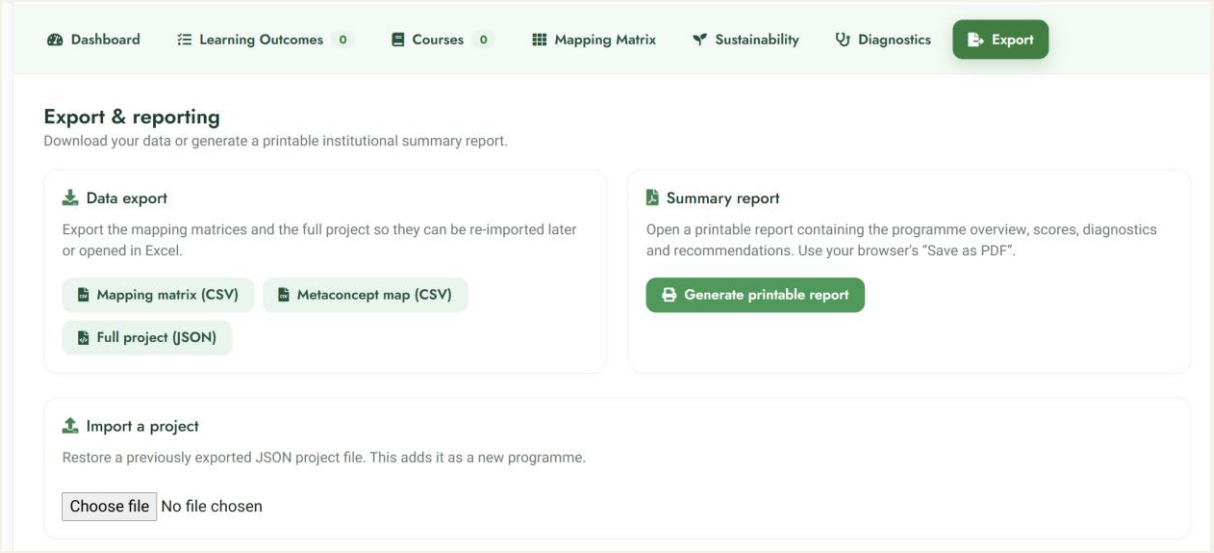
Step 2: Capture Course Data. Add courses and modules, specifying their teaching methods and the extent to which they involve external stakeholders or real-world challenges.

Step 3: Populate the Mapping Matrices. Map each course against the PLOs and the six sustainability metaconcepts using the 0–3 integration scale.

Step 4: Review Diagnostics and Reports. Analyze the automated findings to identify "sustainability deserts" or areas where progression is illogical.

Step 5: Export and Share. Generate a *Printable Summary Report* containing the programme overview, scores, and strategic recommendations to inform curriculum review and quality enhancement

Visit the LEAF Mapper's page to start the mapping process.



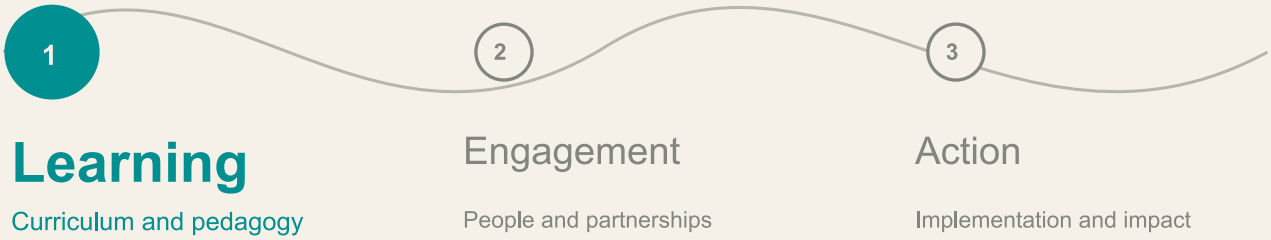
03 Integrate Sustainability Content

Purpose

Once sustainability learning outcomes have been defined and existing courses have been mapped, the next challenge is determining how sustainability can be meaningfully embedded within disciplinary content.

Across higher education, this stage consistently emerges as one of the most challenging aspects of curriculum greening. While universities increasingly recognise sustainability as a strategic priority, educators frequently report uncertainty about what sustainability content is appropriate for their discipline, how it can be integrated without overloading existing curricula, and how disciplinary identity can be maintained while responding to global sustainability agendas. These implementation challenges have been identified across a wide range of institutional contexts and disciplinary settings (Aljaffal et al., 2025; Ncube et al., 2026; Nguyen et al., 2025).

THIS SECTION / LEARNING PILLAR



The GREEN LEAF framework approaches content integration as a process of **curriculum enrichment.** The GREEN LEAF framework positions sustainability as an integral part of disciplinary learning. Existing concepts and professional practices are revisited through perspectives such as systems thinking, resilience, justice, ethical responsibility, futures thinking, and action, enabling learners to understand how their discipline relates to contemporary sustainability challenges. In this way, sustainability is woven into the curriculum as a cross-cutting perspective that enriches disciplinary understanding and prepares graduates for increasingly complex professional contexts. This approach aligns with UNESCO's call for sustainability to be embedded across disciplines through contextualised, action-oriented learning and reflects GreenComp's emphasis on developing sustainability competences across all fields of study.

Content Integration as Curriculum Redesign

Evidence consistently suggests that successful curriculum greening rarely depends on adding new sustainability modules. Instead, it involves redesigning existing learning experiences so that sustainability becomes an organising perspective for disciplinary knowledge (Cardiff et al., 2024; Lewis & Bader, 2026).

This distinction is particularly important because curriculum overload remains one of the most frequently reported barriers to sustainability integration. Faculty often perceive sustainability as "additional content" competing with already crowded programmes, especially in professionally regulated disciplines (Aljaffal et al., 2025; Moda & Chauhan, 2026).

Curriculum redesign begins with a different question:

How can the concepts I already teach help students understand and respond to contemporary sustainability challenges?

This shift is particularly important because curriculum overload remains one of the most frequently reported barriers to sustainability integration, especially in professionally regulated programmes

The *LEAF Content Integration Canvas* (see Figure 11) is designed to support educators in identifying meaningful opportunities for integrating sustainability within existing courses. Instead of focusing on what new sustainability topics could be introduced, the canvas encourages reflection on the educational value of the content that is already taught. It helps educators examine where disciplinary concepts naturally intersect with sustainability and how these connections can be made more visible and relevant for learners.

The canvas guides educators through a structured redesign process, beginning with an existing course topic and progressively exploring authentic sustainability challenges, relevant LEAF metaconcepts, contextual examples, and the implications for student learning. It encourages holistic thinking about curriculum design and makes the relationships between content, context, and learning more explicit.

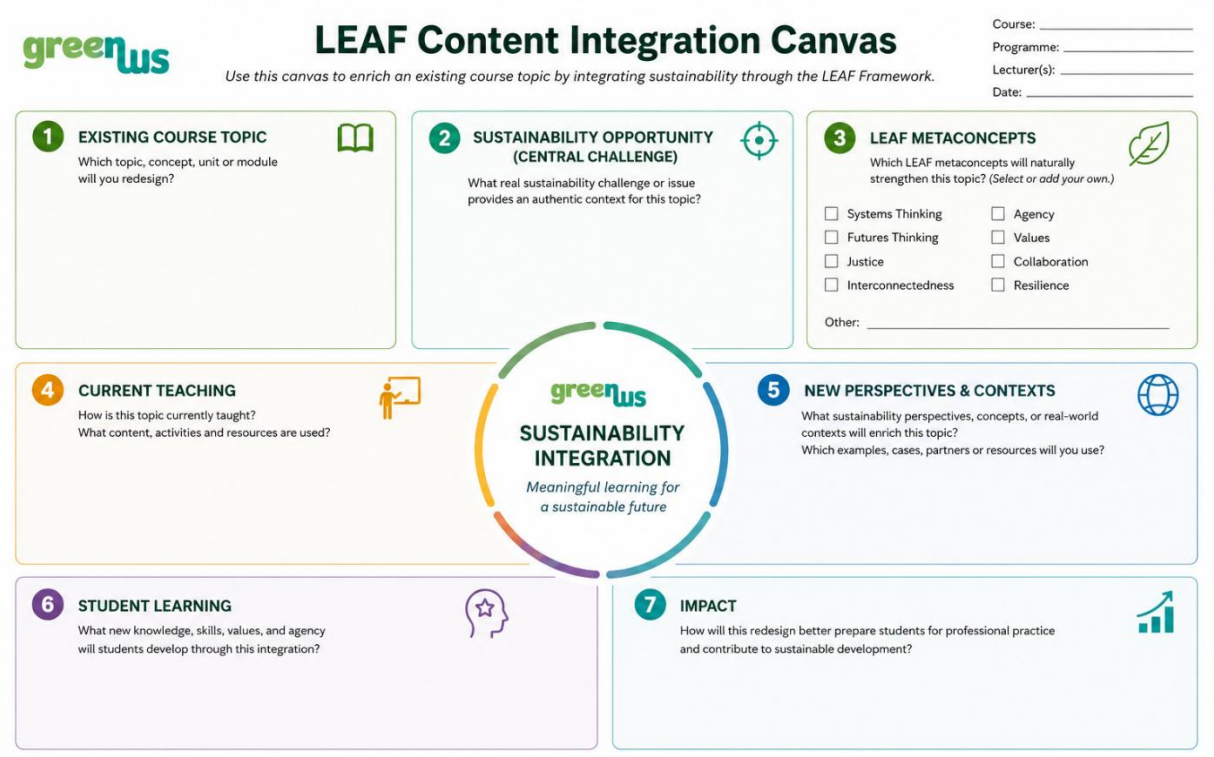
Importantly, the canvas is not intended to generate entirely new curricula. Instead, it supports the enrichment of existing courses by identifying opportunities to reinterpret disciplinary knowledge through sustainability perspectives while maintaining the coherence and integrity of the discipline. The completed canvas also serves as a useful record of curriculum redesign decisions and can facilitate discussions within programme teams, curriculum committees, and quality assurance processes.

illustrates how the LEAF Content Integration Canvas was applied to redesign the undergraduate course Fundamentals of Education and Curriculum Theory, demonstrating how sustainability can

become an organising perspective for existing disciplinary content without increasing curriculum overload.

Figure 11

The LEAF Content Integration Canvas



Box 4

Integrating Sustainability into an Introductory Pedagogy Course

The undergraduate course *Fundamentals of Education and Curriculum Theory*, a core component of an Initial Teacher Education programme in Romania, illustrates how sustainability can be embedded within an existing curriculum by reorganising disciplinary content around contemporary educational challenges (Manasia & Negreanu, 2024). The redesign did not introduce sustainability as a separate topic. Instead, the course was reconceptualised to explore how the foundations of education and curriculum theory can help future teachers understand and respond to the complex realities shaping education today.

The content was organised around *seven macro-level educational challenges*, including digitalisation in education, inclusive curriculum design, education for sustainability, learner wellbeing, equity, and curriculum innovation. Each thematic unit connected classical concepts from educational theory with contemporary policy debates and professional practice, helping students examine how curriculum decisions influence not only what learners know, but also the values, attitudes, and competences they develop.

The accompanying learning resources were also revised to support this integrated perspective. Discussions of *the aims and functions of education* were expanded to include questions of sustainability, social responsibility, democratic participation, and global citizenship. The unit on *lifelong learning* introduced the Sustainable Development Goals and the European GreenComp framework, positioning sustainability competences within the broader mission of education. Topics such as *curriculum design, inclusion, digital transformation*, and *open education* were enriched with authentic examples, international policy frameworks, and contemporary educational dilemmas, enabling students to connect pedagogical theory with current societal challenges.

Box 4
Integrating Sustainability into an Introductory Pedagogy Course

To strengthen the relevance of the content, each thematic unit opened with a short fictionalised vignette inspired by authentic educational experiences and concluded with optional cultural resources—including films, novels, and music—that encouraged students to explore the broader human, ethical, and societal dimensions of the topic (Manasia et al., 2026). These elements helped situate theoretical concepts within meaningful contexts while fostering critical reflection on the role of education in creating more inclusive, resilient, and sustainable societies.

Principles for Selecting Sustainability Content

Research suggests that meaningful curriculum greening depends less on the quantity of sustainability content than on the quality of its integration. Successful courses connect disciplinary knowledge with authentic societal challenges, promote sustainability competences rather than isolated factual knowledge, and encourage learners to apply disciplinary expertise in real-world contexts (Lewis & Bader, 2026; Ncube et al., 2026).

Within the LEAF Framework, this process is guided by five principles.

- **Build on existing disciplinary knowledge**

Curriculum greening begins with what is already taught. Rather than replacing disciplinary concepts, sustainability perspectives enrich existing content and reveal connections that may already exist but remain implicit.

- **Use sustainability metaconcepts as organising ideas**

LEAF metaconcepts provide a shared conceptual language across disciplines while allowing each programme to preserve its own epistemological traditions. They support interdisciplinary dialogue without prescribing identical content for every discipline.

- **Connect learning with authentic contexts**

Disciplinary knowledge becomes more meaningful when explored through professional practice, community challenges, institutional sustainability initiatives, or local environmental and social issues. Authentic contexts help students understand how theoretical concepts operate within complex real-world systems.

- **Adapt integration to disciplinary contexts**

Sustainability looks different across disciplines. Systems thinking may emerge through infrastructure in engineering, educational ecosystems in teacher education, or circular economy models in business. Flexible integration is therefore more effective than prescribing identical sustainability content across programmes.

- **View curriculum greening as an ongoing process**

Curriculum transformation is iterative rather than linear. It develops through repeated redesign, collaboration among colleagues, institutional support, and continuous reflection on teaching practice.

The objective is not to increase the volume of content, but to strengthen graduates' capacity to understand complexity, navigate uncertainty, and act responsibly within their professional fields.

From Topics to Metaconcepts

One of the most common concerns when greening curricula is deciding what sustainability content should be incorporated into existing courses. This challenge often stems from the perception that sustainability represents an additional body of knowledge competing for space in already crowded curricula. In practice, however, successful curriculum greening rarely depends on introducing entirely new topics. Instead, it builds on existing disciplinary knowledge, making explicit the sustainability dimensions that are often already present, although not always recognised.

Within the LEAF Framework, sustainability is organised around a set of interconnected metaconcepts that provide a common conceptual language across disciplines. These metaconcepts do not prescribe identical content for every programme; instead, they offer a shared framework through which disciplinary knowledge can be interpreted, expanded, and connected to contemporary sustainability challenges. This approach enables programmes to contribute to common sustainability competences while preserving their own epistemological traditions and disciplinary identities. It also reflects one of the recurring findings emerging from the literature: sustainability integration is most effective when it respects disciplinary diversity while creating opportunities for interdisciplinary dialogue and competence development (Cardiff et al., 2024; Ncube et al., 2026).

The process of content integration begins by identifying **natural points of convergence** between disciplinary concepts and sustainability metaconcepts. In engineering, systems thinking may emerge through the analysis of infrastructure, energy systems, or manufacturing processes. In education, it may be reflected in the relationships between learners, schools, communities, and policy. In economics, it may be explored through global supply chains, circular economy models, or resource allocation. Although these contexts differ, they contribute to the development of the same underlying sustainability competences.

Once these connections have been identified, the focus shifts from introducing new content to enriching existing content. Traditional disciplinary concepts are revisited through broader perspectives that encourage learners to consider long-term consequences, interactions between environmental, social, economic, and technological systems, ethical implications, stakeholder perspectives, and future scenarios. Sustainability therefore becomes a dimension of disciplinary inquiry that strengthens, rather than replaces, disciplinary expertise.

A further step involves situating disciplinary knowledge within authentic contexts. Case studies, professional practice, institutional sustainability initiatives, community challenges, and local environmental or social issues provide meaningful opportunities for students to examine how theoretical concepts operate in complex real-world settings. Such contextualisation not only increases the relevance of learning but also supports the development of sustainability competences that extend beyond conceptual understanding.

Importantly, the ways in which sustainability is integrated will vary across disciplines. Reviews of higher education practice show that curriculum greening has progressed unevenly, with STEM disciplines generally demonstrating higher levels of integration than the arts, humanities, and some professionally regulated fields (Liu & Kan, 2024; Wee et al., 2024; Esteban Ibáñez et al., 2026). This diversity reinforces the need for flexible curriculum frameworks that encourage contextual adaptation rather than prescribing uniform sustainability content.

Curriculum greening should therefore be understood as a developmental process rather than a single curriculum revision exercise. Sustainable curriculum transformation evolves over time through iterative redesign, interdisciplinary collaboration, institutional leadership, faculty development, and ongoing reflection on educational practice (Nguyen et al., 2025; Horan & Sayer, 2026; Ncube et al., 2026). Viewed in this way, the objective is not to increase the volume of content but to enrich disciplinary perspectives so that graduates are better prepared to understand complexity, navigate uncertainty, and contribute responsibly within their professional and civic lives.

The shift from adding sustainability topics to enriching existing disciplinary content begins with asking different questions. The LEAF Framework encourages educators to identify where sustainability perspectives already intersect with disciplinary knowledge. Table 7 illustrates this shift in thinking and highlights how sustainability metaconcepts can guide curriculum redesign.

Table 7

Reframing Content Integration through Sustainability Metaconcepts

Instead of asking...	Ask yourself...	Implication for curriculum redesign
What sustainability topics should I add to this course?	Which sustainability dimensions are already embedded within the concepts I teach?	Start from existing disciplinary knowledge rather than introducing additional content.
Which Sustainable Development Goals should I cover?	Which LEAF metaconcepts naturally connect with this topic?	Use metaconcepts as organising ideas that link disciplinary content with sustainability competences.
What new lecture should I include?	How can I reinterpret this topic through a sustainability lens?	Revisit existing concepts through systems thinking, justice, resilience, ethics, futures thinking, or action.
How can I fit sustainability into an already crowded syllabus?	How can sustainability enrich what students are already learning?	Curriculum greening becomes enrichment rather than curriculum expansion.
Which sustainability facts should students remember?	What should students be able to understand, value, and do differently after studying this topic?	Focus on developing sustainability competences rather than transmitting additional factual knowledge.
How can I make this topic more relevant?	Which authentic sustainability challenge could help students apply this knowledge?	Connect disciplinary concepts with professional practice, community issues, or real-world case studies.
How should sustainability be taught in my discipline?	How does my discipline uniquely contribute to sustainability?	Preserve disciplinary identity while making its contribution to sustainability explicit.
When is my course sufficiently green?	How can I continue improving this course over time?	Treat curriculum greening as an iterative process of reflection, redesign, and continuous enhancement.

Sustainability metaconcepts

Common lenses, many disciplinary expressions. These metaconcepts provide a shared language for sustainability learning. They are not disciplines or topics in themselves, but interconnected lenses through which every field of study can explore real-world challenges and opportunities.

01 Systems and interconnectedness

How do the parts relate to the whole and to wider systems?

Question to explore

What is this part of the system connected to, and how does it affect the whole?

Engineering: infrastructure networks
Biology: ecosystem interactions
Economics: global value chains
Education: learning ecosystems

Competences from GreenComp

Systems thinking; critical thinking

02 Circularity and resource stewardship

How can we use, reuse and regenerate resources within planetary limits?

Question to explore

How can this process be redesigned to minimise waste and maximise value?

Design: circular product design
Business: circular business models
Agriculture: nutrient cycles
Chemistry: green chemistry

Competences from GreenComp

Exploring sustainable futures; problem framing

03 Equity and justice

Who benefits, who is left behind, and how can fairness be advanced?

Question to explore

Who gains and who loses from this situation, and why?

Sociology: social inequality
Public Policy: access to services
Education: inclusive learning
Health: health inequalities

Competences from GreenComp

Valuing sustainability; empathy and fairness

04 Ethics and responsibility

What values guide our decisions and actions toward people and planet?

Question to explore

What is the right thing to do here, and why?

Medicine: ethics of care
Data Science: responsible AI
Law: human rights and environment
Psychology: well-being and dignity

Competences from GreenComp

Ethical thinking; values reflection

Sustainability metaconcepts continued

05 Futures and anticipation

What are possible, plausible and desirable futures, and how do our choices shape them?

Question to explore

What might the future look like if we continue—or change—this path?

Urban Planning: scenario planning
Education: futures literacy
Management: strategic foresight
Climate Science: projections

Competences from GreenComp

Futures literacy; adaptability

06 Participation and collaboration

Who is involved, whose voices matter, and how do we learn and act together?

Question to explore

Whose perspectives are missing, and how can we work together more inclusively?

Political Science: deliberative processes
Community Work: co-creation
Communication: stakeholder dialogue
Education: student voice

Competences from GreenComp

Collaboration; collective action

07 Innovation and transformation

What new ideas, approaches or systems can create sustainable change?

Question to explore

What new approach could lead to more sustainable and equitable outcomes?

Engineering: clean technologies
Entrepreneurship: social innovation
Arts and Design: creative solutions
ICT: digital solutions for sustainability

Competences from GreenComp

Creativity; action competence

These metaconcepts are interconnected. Real-world sustainability challenges require integrating multiple lenses simultaneously.

Reframe what you already teach

LEAF Content Integration Dash

The **LEAF Content Integration Dash** is a facilitated curriculum redesign toolkit that helps educators translate the principles of content integration into a concrete learning experience. It addresses a recurring challenge in curriculum greening: educators may recognise the relevance of sustainability but remain uncertain about how to connect it with the concepts they already teach without adding more material to an already crowded curriculum (see Figure 12).

Figure 12

Components of the LEAF Content Integration Dash toolkit: Participant Activity Pack, Facilitator Guide, and LEAF Metaconcept Cards



The Dash begins from a simple rule:

Do not add another sustainability topic. Reframe something students already need to learn.

Working in teams of three or four, participants select one existing course topic, concept, method, case, professional practice, or learning resource. They first clarify the disciplinary core: what students must understand and what they must be able to do. This step protects the coherence and integrity of the discipline throughout the redesign process.

Participants then examine what the current treatment of the topic may leave implicit. They consider whose knowledge is recognised, who or what is affected, which perspectives are visible, and which remain absent. A short interview with a participant from another team introduces an additional perspective and helps identify authentic contexts, practical consequences, stakeholder experiences, and connections beyond the classroom.

The teams use the **LEAF Metaconcept Cards** to explore the topic through one primary sustainability lens:

- systems and interdependence;
- justice, equity, and responsibility;
- futures and anticipation;
- sustainable production and consumption;
- human-nature relationships;
- agency, governance, and collective action.

The metaconcepts are used as interpretive lenses, not as additional content categories that must be covered. Teams select the lens that most meaningfully deepens disciplinary understanding and frame the resulting learning opportunity through the following statement:

Students currently learn _____, but they rarely examine _____.

Participants generate several possible ways to address this opportunity. They may replace an existing case, change the central question, introduce a previously absent voice, work with different evidence, situate the topic in an authentic context, or explore its long-term implications. One idea is selected and transformed into a tangible prototype, such as a revised learning prompt, case study, discussion format, data task, role-play, short inquiry, or storyboard.

Each prototype is reviewed by another team. Reviewers consider whether the sustainability connection is authentic to the discipline, where it may feel forced, which perspectives remain missing, and how the activity could become more feasible or educationally meaningful. Feedback is then used to produce a revised version.

A defining feature of the toolkit is the *no-overload test*. Before finalising the redesign, teams must identify what has been replaced, reframed, shortened, or reinterpreted. They also verify that the disciplinary core remains explicit, that sustainability changes the inquiry rather than only its terminology, that students actively work with the identified connection, and that the redesigned experience can fit within the existing teaching time.

The process concludes with the **Content Reframing Card**, which records the existing topic, disciplinary core, selected metaconcept, authentic context or perspective, redesigned learning experience, expected learning shift, and no-overload decision. This card provides a concise record that can support subsequent course planning, programme-level discussion, curriculum review, or completion of the more detailed LEAF Content Integration Canvas.

The complete toolkit comprises an editable and printable participant PowerPoint, a Facilitator Guide with adaptable 60- and 90-minute workshop formats, six printable LEAF Metaconcept Cards, and a peer-feedback card. It can be used in faculty development sessions, departmental curriculum workshops, programme review meetings, interdisciplinary design events, or collaborative planning sessions involving educators, students, practitioners, and community partners.

The toolkit is inspired by the rapid, staged format of the **Design Dash**, created by Molly Wilson at the HPI School of Design Thinking, and adapts this approach to sustainability-oriented curriculum redesign.

Visit https://greenus.upb.ro/ to download the toolkit.

04 Transform Pedagogy

Purpose

Once sustainability content has been integrated into the curriculum, the next step is to reconsider how students engage with that content. Developing sustainability competences requires more than expanding disciplinary knowledge. It requires learning experiences that enable students to investigate complex problems, collaborate across disciplinary and professional boundaries, reflect on values and assumptions, and translate knowledge into meaningful action.

For this reason, curriculum greening is concerned with *what* students learn, and also with *how* they learn. The GREEN LEAF Framework promotes pedagogical approaches that position students as active participants in addressing authentic sustainability challenges rather than passive recipients of information. Learning becomes a process of inquiry, collaboration, experimentation, and reflection through which disciplinary knowledge is applied to complex real-world contexts.

THIS SECTION / LEARNING PILLAR



Learning
Curriculum and pedagogy

Engagement
People and partnerships

Action
Implementation and impact

From Knowledge Transmission to Transformative Learning

Traditional teaching approaches have played an essential role in developing disciplinary understanding. Lectures, seminars, laboratory sessions, and individual assignments remain valuable for introducing concepts, building foundational knowledge, and supporting analytical thinking. However, sustainability challenges are characterised by uncertainty, complexity, multiple stakeholder perspectives, and the absence of simple solutions. Preparing students for these realities requires learning experiences that extend beyond knowledge acquisition alone.

Transformative learning encourages students to question assumptions, examine multiple perspectives, understand relationships between environmental, social, economic, and technological systems, and recognise their own capacity to contribute to change. Rather than treating sustainability as another topic within the curriculum, it enables students to experience sustainability as a way of thinking and acting within their future professional practice.

Transforming pedagogy involves redesigning learning activities so that students actively investigate authentic problems, collaborate with others, reflect critically on their learning, and apply disciplinary expertise in meaningful contexts.

Design Principles for Transformative Sustainability Learning

Although many pedagogical approaches can support sustainability education, evidence suggests that successful learning experiences share a number of common characteristics. These principles can guide curriculum redesign regardless of discipline or teaching method.

- **Start from authentic sustainability challenges**

Learning activities should be organised around real issues that matter to students, communities, organisations, or society. Authentic problems increase relevance, motivate engagement, and demonstrate how disciplinary knowledge contributes to addressing sustainability challenges.

- **Encourage systems thinking**

Students should be supported in analysing relationships rather than isolated components. Learning activities should encourage them to explore interactions, feedback loops, unintended consequences, and connections across environmental, social, economic, and technological systems.

- **Create opportunities for collaboration**

Sustainability challenges cannot be addressed from a single disciplinary perspective. Learning should therefore encourage collaboration among students as well as interaction with educators, external experts, community organisations, policy-makers, and industry partners whenever appropriate.

- **Promote critical reflection**

Transformative learning requires opportunities for students to examine their own assumptions, values, and decision-making processes. Reflection helps learners connect disciplinary knowledge with ethical responsibility, professional identity, and societal impact.

- **Connect learning with action**

Whenever possible, learning should culminate in designing, proposing, testing, or evaluating responses to authentic sustainability challenges (see to get inspired). Students do not need to solve global

problems; rather, they should experience how disciplinary knowledge can contribute to meaningful action within realistic contexts.

Box 5
From Classroom to Community: Service-Learning for Sustainability in Veterinary Education

The elective course **Service-Learning and Animal Rescue** at the University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca illustrates how service-learning can transform sustainability education by connecting academic learning with authentic community engagement. Offered to second-year students in the *Animal Behaviour and Welfare* programme, the course combines theoretical preparation in service-learning methodologies with community-based projects developed in collaboration with local schools and animal protection organisations.

Students work with community partners to identify local needs related to responsible human–animal interactions, animal welfare, and animal rescue. Rather than responding to predefined assignments, they co-design and implement projects with NGOs and educators, organise awareness and adoption campaigns, support rescue initiatives, and deliver educational activities for children participating in the national programme *The Hour with and for Animals*. Throughout the course, community partners contribute as beneficiaries, co-educators, and co-designers, ensuring that learning activities address authentic societal needs.

Reflection is an integral part of the learning process. Guided journals, group discussions, and activities based on the **DEAL (Describe–Examine–Articulate Learning)** framework help students connect their experiences with disciplinary knowledge while developing critical thinking, civic responsibility, teamwork, and communication skills. The course also introduces a **One Health–One Welfare** perspective, encouraging students to recognise the interconnections between human wellbeing, animal welfare, and environmental sustainability.

Pedagogical Approaches for Sustainability Learning

No single pedagogical approach is appropriate for every course or discipline. Instead, educators should select approaches that align with their learning outcomes, disciplinary traditions, available resources, and opportunities for stakeholder engagement. In practice, many sustainability courses combine several pedagogical approaches within the same learning experience.

Pedagogical approach	Main contribution to sustainability learning	Typical learning activities
Experiential learning	Connects theory with direct experience and structured reflection	Fieldwork, simulations, laboratories, reflective journals, site visits
Problem-based learning	Develops inquiry, systems thinking, and collaborative problem solving	Student teams investigate complex sustainability problems using disciplinary knowledge

Pedagogical approach	Main contribution to sustainability learning	Typical learning activities
Challenge-based learning	Encourages learners to co-create solutions with external stakeholders	Projects addressing authentic challenges proposed by municipalities, NGOs, schools, or companies
Community-based learning	Strengthens civic engagement and social responsibility	Service-learning, participatory research, community partnerships
Living Labs	Integrates education, research, and innovation in real-world settings	Long-term collaboration with institutions, campuses, cities, or communities to co-design sustainability solutions

Box 6
Co-creating Sustainable Design Solutions through Service-Learning at Universidad Politécnica de Madrid

The *Art, Technology and Society* course at Universidad Politécnica de Madrid (UPM) demonstrates how transformative pedagogies can be integrated into engineering education through service-learning and participatory design. Rather than developing design solutions for hypothetical clients, undergraduate Industrial Design Engineering students collaborate with local NGOs, cultural centres, and social enterprises to address authentic community needs related to sustainability and social inclusion.

Working in interdisciplinary teams, students engage in a process of co-design with community partners to develop prototypes, interactive installations, or educational resources that respond to locally identified challenges. The learning process combines lectures on sustainability and the Sustainable Development Goals with field visits, collaborative workshops, iterative design, and structured reflection. Community partners actively contribute throughout the project by defining needs, mentoring student teams, and participating in the evaluation of project outcomes.

This approach transforms the role of students from designers of technical artefacts to co-creators of socially meaningful solutions. By integrating experiential learning, community-based learning, and challenge-based learning within a single project, the course develops not only design and project management skills but also collaboration, systems thinking, empathy, and an understanding of the social responsibility of engineering practice. The case illustrates how authentic stakeholder engagement can enrich disciplinary learning while fostering sustainability competences without requiring additional curriculum content.

Learn more

Box 7
The Learning Station (LS) Model: Co-Creating Active Learning

Developed by the *ITU Centre for Excellence in Education (ITU CEE)*, the *Learning Station (LS)* is an innovative teaching and learning framework and a practical planning tool designed to co-create active learning experiences. It operates on a *module-based learning* landscape, allowing any active learning method to be implemented alone or in combination with others to build a comprehensive learning journey.

Core Principles

- Active Learning & Engagement: The model moves away from traditional passive formats, requiring learners to engage in knowledge construction, critical thinking, and independent problem-solving.
- Modular Design: A learning experience can consist of single or multiple independent modules that can be canonically or iteratively combined to compose a complete experience.
- Co-Creation with Stakeholders: LS design encourages active participation from a diverse range of actors, including students, academics, researchers, alums, and industry professionals.
- A Shift to Mentorship: Ownership of learning is transferred to the learner, requiring educators to shift their mindset from traditional instruction to mentorship.

Structural Components: The LS Catalog Form

The planning of a Learning Station is facilitated through the LS Catalog Form, which serves as both a declaration and a roadmap for the learning experience. It includes:

1. LS Information Table: A brief overview indicating the title, level (Basic to Advanced), SMART learning objectives, and intended learning outcomes. It also maps the station's alignment with the UN Sustainable Development Goals (SDGs).
2. LS Matrix: A graphical interface that bridges the learning objectives and outcomes with specific content delivery modes and assessment elements.

Diverse Delivery and Assessment

To accommodate learning strategies, the model utilizes a wide variety of content delivery modes, including:

- Digital and Physical Tools: Videos, podcasts, simulation, gamification, and AI-driven interactive environments.
- Experiential Learning: Site visits, hands-on exercises, laboratory work, and storytelling.
- Integrated Assessment: Specific assessment methods are predefined for each module, ensuring they are achievable and measurable targets.

The LS model is an open-ended and living framework that uses iterative cycles of implementation and feedback to ensure continuous improvement and institutional quality assurance

Download the LS Guide

The LEAF Wheel

Transformative sustainability learning is shaped not only by **what** students learn, but also by **how** they learn. While many pedagogical approaches can support sustainability education, simply adopting an innovative teaching method does not guarantee meaningful learning. What matters most is how learning experiences are designed.

The **LEAF Pedagogy Wheel** (Figure 13) is a simple reflective tool that helps educators review the pedagogical design of a course, module, or learning activity. It focuses on four characteristics that consistently underpin transformative sustainability learning. Whether you are planning a field project, a laboratory activity, a case study, a challenge-based assignment, or a community partnership, the wheel can help you consider whether the learning experience creates meaningful opportunities for students to develop sustainability competences.

Figure 13
The LEAF Pedagogy Wheel for Transformative Sustainability Learning

LEAF Pedagogy Wheel

Orienting learning towards sustainability



01 Authentic challenge

Does learning address an authentic sustainability problem that matters in the real world?

☐ Yes

02 Systems thinking

Do activities help students understand relationships, interdependencies, complexity and multiple perspectives?

☐ Yes

03 Reflection

Are opportunities provided for critical reflection before, during and after the learning experience?

☐ Yes

04 Stakeholder engagement

Do students collaborate with communities, organisations or external partners in meaningful ways?

☐ Yes

Use the wheel to review an activity or course design. Check each element. When all four are present, learning drives sustainability competence and positive impact.

The four dimensions of the wheel are interconnected. *Authentic challenges* encourage students to engage with real sustainability issues that matter to communities and professional practice. *Systems thinking* helps learners understand complexity, relationships, and the interconnected nature of environmental, social, economic, and technological systems. *Reflection* creates space for students to examine their assumptions, values, and learning, transforming experience into deeper understanding. *Stakeholder engagement* connects learning with people beyond the classroom, allowing students to collaborate with communities, organisations, policy-makers, or industry partners and appreciate multiple perspectives.

At the centre of the wheel is *transformative learning*. This represents the outcome that emerges when the four dimensions are intentionally combined. Learning becomes more than the acquisition of knowledge; it enables students to think critically, work collaboratively, navigate complexity, and act responsibly within their future professional and civic lives.

Use the wheel as a prompt for reflection during course design or review. Consider each of the four dimensions and ask yourself whether it is meaningfully represented in your learning activity. If one or more elements are missing, think about how the activity could be strengthened. Sometimes a small adjustment—such as inviting a community partner, incorporating a reflective exercise, or framing the activity around an authentic sustainability challenge—can significantly enhance students' learning experience.

Box 8
Design Challenge Events: Co-creating Sustainability Solutions at UCLL (Belgium)

At UCLL, *Design Challenge Events (DCEs)* are intensive, collaborative learning experiences that bring together students, educators, industry partners, public organisations, and community actors to address authentic sustainability challenges. Participants collaborate in interdisciplinary teams to develop practical solutions to real problems identified by the community.

The events are embedded within UCLL's broader learning ecosystem and follow a structured process. Participants first build the knowledge and skills required for the challenge through preparatory learning modules. Sustainability challenges are then proposed and selected in collaboration with the community, ensuring that projects respond to genuine societal needs. During the event, interdisciplinary teams work alongside external stakeholders to develop and refine prototypes, benefiting from mentoring, feedback, and access to UCLL's innovation spaces. The process concludes with the presentation of solutions, recognition of outstanding projects, and dissemination of results to maximise their potential for wider implementation.

Design Challenge Events illustrate how challenge-based learning can create meaningful opportunities for students to apply disciplinary knowledge while developing sustainability competences.

Learn more

EN-ROADS Climate Solutions Simulator

Digital simulations can make complex sustainability systems more visible and accessible to learners. They allow students to test assumptions, examine relationships between different interventions, and observe how decisions may produce intended and unintended consequences. **EN-ROADS** provides

one example of how simulation-based learning can be incorporated into problem-based, experiential, or challenge-based activities (see for an example of integration).

Box 9
Tool in Practice: Using EN-ROADS to Explore Climate Solutions

Working in small groups, learners:

1. **Predict** – Select three interventions they believe will have the greatest climate impact and explain their reasoning.
2. **Test** – Use En-ROADS to apply the selected interventions and observe the results.
3. **Revise** – Adjust their scenario to achieve a stronger outcome while considering feasibility, fairness and possible unintended effects.
4. **Compare** – Present and compare scenarios developed by different groups.
5. **Reflect** – Discuss what surprised them, which assumptions changed and which stakeholders would benefit or be disadvantaged.

Groups may also represent different stakeholders—such as governments, businesses, civil society organisations or local communities—to introduce negotiation and competing priorities.

Pedagogical contribution

The activity supports:

- authentic, problem-based learning;
- systems and critical thinking;
- evidence-informed decision-making;
- collaboration and argumentation;
- futures thinking and reflection;
- consideration of justice and multiple perspectives.

Facilitator prompt

Can your group develop a climate strategy that is environmentally effective, socially fair and realistically achievable? What compromises does your scenario require?

Access the tool: En-ROADS Climate Solutions Simulator

HUBI Matrix

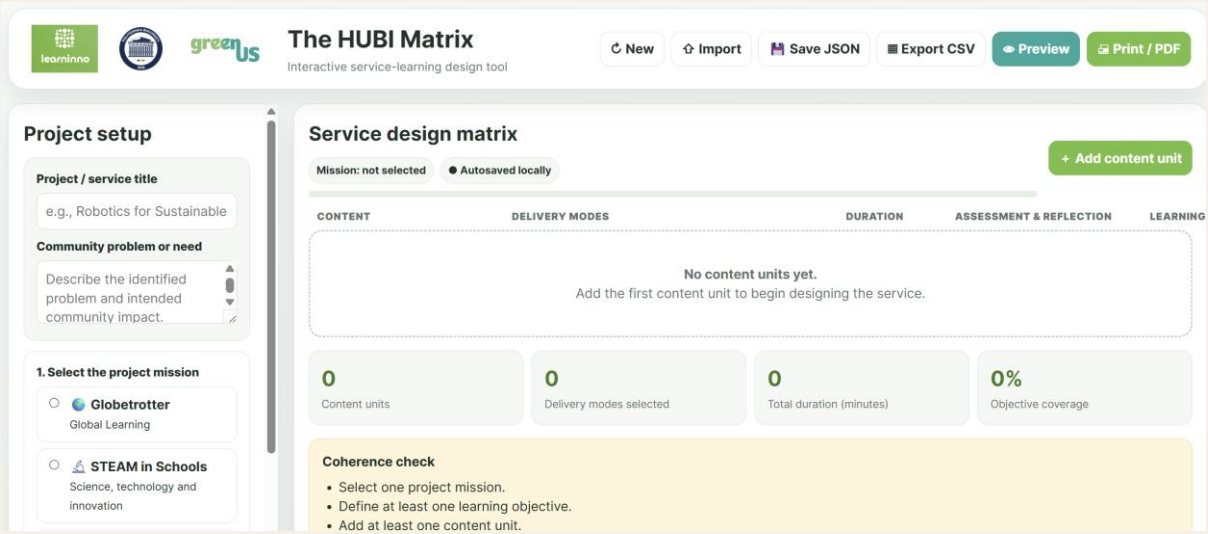
The Interactive HUBI Matrix is a collaborative digital environment designed to support the co-creation of meaningful learning experiences. It enables educators and learners to work together in designing projects, learning activities, and educational services by connecting learning goals with authentic challenges, stakeholder engagement, delivery methods, assessment, and reflection within a single visual planning space.

The matrix guides users through a structured yet flexible design process, allowing teams to define objectives, organise content, select appropriate learning strategies, identify stakeholders, and plan

assessment while maintaining constructive alignment throughout the project. Its adaptable structure supports diverse learning contexts, from community-based initiatives and service-learning projects to interdisciplinary courses, challenge-based learning, and the development of educational resources.

Interactive features—including drag-and-drop organisation, automatic coherence checks, visual alignment maps, progress indicators, autosave, and exportable reports—facilitate collaborative planning and iterative refinement.

Visit the GreenUS Catalogue's page to download the matrix.



Box 10
Co-creating learning with master's students

The HUBI Matrix has been successfully integrated into a compulsory Master's course in *Teaching Practicum for STEM Teachers* at the National University of Science and Technology POLITEHNICA Bucharest. Students use the matrix throughout the investigation, planning, implementation, and reflection phases of service-learning projects, working alongside educators, schools, NGOs, and other community partners. Working collaboratively with educators, application schools, NGOs, and other community partners, master's students use the matrix to investigate community needs, design educational services, plan implementation, and reflect on their learning. The tool promotes student agency by positioning learners as co-designers of meaningful learning experiences while ensuring constructive alignment between learning outcomes, community engagement, assessment, and reflection.

ⓘ Search the GreenUS catalogue to download the HUBI Matrix

Vertically Integrated Projects: learning that grows over time

Vertically Integrated Projects (VIPs) bring students from different disciplines and stages of study together in long-term, faculty-led research and innovation teams. Students work on authentic problems connected to ongoing research or societal challenges and may remain with the same team for several semesters. As their experience grows, so does their role: newcomers learn from more experienced peers, returning students take greater responsibility, and some progress towards mentoring and leadership.

This continuity is what makes VIPs particularly valuable for transformative sustainability learning. Complex challenges such as energy transition, resilient cities, health, inclusion or responsible technologies cannot always be meaningfully explored within a short classroom task. VIPs give students time to investigate a problem, test ideas, learn from setbacks, work across disciplinary boundaries and see how a project evolves.

The model also changes relationships within the learning environment (see). Faculty act as research leaders and mentors, experienced students support newer members, and external organisations can become collaborators in the work. Learning therefore develops through participation, contribution and increasing responsibility.

Box 11
Practice example: VIP4SD at the University of Strathclyde — connecting interdisciplinary learning, research and sustained student action around real-world sustainability challenges

The *University of Strathclyde's Vertically Integrated Projects for Sustainable Development (VIP4SD)* illustrate how this approach can support curriculum greening across very different fields. Its portfolio includes projects addressing renewable energy, sustainable and resilient cities, satellite data for sustainable development, health technologies, robotics, STEM inclusion and community-based digital solutions. Sustainability becomes a shared context for applying disciplinary knowledge and working with others on questions that have relevance beyond the classroom.

ⓘ Learn more about VIPs at the University of Strathclyde

For curriculum redesign, VIPs offer a useful way to connect the three dimensions of *GREEN LEAF — Learning, Engagement and Action*. Students develop knowledge and competences through research and interdisciplinary work, engage with peers, mentors and external stakeholders, and contribute to projects capable of producing tangible research, technological or societal outcomes.

05 Align Assessment

Purpose

Curriculum greening requires assessment practices that capture what students can do with their sustainability knowledge. Remembering concepts remains important, but knowledge recall alone cannot demonstrate whether learners can analyse complex systems, reason through ethical tensions, collaborate with others, or develop responsible responses to sustainability challenges.

Assessment must therefore be aligned with the sustainability competences expressed in the learning outcomes and enacted through the pedagogical approaches used in the course. If students are expected to investigate authentic problems, work with stakeholders, consider competing values, and propose meaningful action, these capabilities should also be visible in the assessment process.

THIS SECTION / LEARNING PILLAR



The purpose of this step is to move from assessing sustainability content towards assessing the informed, reflective and responsible application of that content.

From Testing Knowledge to Demonstrating Competence

Competence becomes visible through performance. Systems thinking can be assessed when students analyse relationships and anticipate consequences. Ethical reasoning becomes visible when they recognise competing values, consider who may benefit or be disadvantaged, and justify a decision. Collaborative competence is demonstrated through interaction, shared responsibility and responsiveness to feedback. Action competence is shown when students translate analysis into a feasible course of action.

This requires a broader range of evidence than a final written examination can usually provide. Projects, simulations, case analyses, portfolios, presentations, reflective accounts and stakeholder feedback allow learners to demonstrate how they mobilise knowledge, skills, values and agency in context.

Assessment is not simply the final stage of learning. What and how educators assess influence how students approach the entire learning experience. The LEAF Guidebook recommends combining direct evidence of performance with reflection, self-assessment, peer feedback and evidence collected over time.

Principles for Sustainability Competence Assessment

- **Align assessment with learning outcomes.** Each sustainability learning outcome should be connected to an observable performance. If an outcome expects students to evaluate the systemic consequences of a proposed intervention, the assessment should require them to demonstrate that analysis rather than merely define systems thinking.
- **Assess competence in context.** Sustainability competences should be assessed through tasks that resemble the situations in which they may be needed. Cases, simulations, field investigations and community projects provide opportunities for students to work with uncertainty, incomplete information, conflicting interests and real constraints.
- **Assess both process and product.** A polished final product does not reveal everything students have learned. Assessment should also consider how they investigated the problem, used evidence, distributed responsibility, engaged with feedback, reconsidered assumptions and refined their response.
- **Use multiple sources of evidence.** No single instrument can capture the full complexity of sustainability competence. Evidence may come from project outputs, observation, reflective writing, portfolios, presentations, peer assessment, self-assessment and feedback from community or professional partners.
- **Make criteria visible from the beginning.** Students should receive the assessment criteria when the task is introduced. Rubrics can help learners understand what quality looks like, monitor their progress and provide focused feedback to peers. Whenever possible, students and stakeholders can contribute to interpreting or refining the criteria.
- **Create opportunities for feedback and revision.** Competence develops through practice. Formative checkpoints, peer critique, educator feedback and stakeholder consultation should allow students to revise their work before final assessment. Self-assessment is most valuable when learners have sufficient time to use the information to improve their performance.
- **Protect individual accountability.** Collaborative projects should recognise team achievement while also gathering evidence of individual learning. Individual reflections, short oral

examinations, contribution records and peer assessment can help distinguish collective output from each student's development.

What should be assessed?

Competence area	Observable indicators	Possible assessment evidence
Systems thinking	Identifies relevant system elements; explains relationships and interdependencies; recognises feedback loops; considers different scales and time horizons; anticipates unintended consequences	Systems maps, causal-loop diagrams, scenario comparisons, case analyses, simulation records, oral explanations
Ethical reasoning	Recognises value tensions; identifies affected groups; considers justice, equity and responsibility; examines assumptions; justifies decisions using ethical and disciplinary reasoning	Ethical dilemma analysis, position paper, stakeholder perspective map, reflective commentary, structured debate
Collaborative competence	Contributes responsibly; listens to different perspectives; shares information; manages disagreement; integrates feedback; supports collective decision-making	Observation notes, team records, peer assessment, meeting logs, co-created products, stakeholder feedback
Action competence	Proposes a relevant response; connects action to evidence; considers feasibility and resources; identifies responsibilities; anticipates risks; defines indicators of progress	Action plan, prototype, policy proposal, campaign, implementation roadmap, pitch, impact pathway
Critical reflection	Examines assumptions and limitations; explains how thinking changed; interprets feedback; recognises personal and collective learning; identifies areas for further development	Reflective portfolio, learning journal, velfie, post-project reflection, self-assessment against the rubric

Make competence visible

The LEAF Sustainability Competence Rubric

A common rubric can be adapted to different disciplines, educational levels and learning activities. It is not intended to reduce complex competences to a single score. Its purpose is to make expectations visible, support formative feedback and help educators judge performance consistently.

Dimension	Emerging	Developing	Competent	Transformative
Systems thinking	Identifies isolated aspects of the problem, with limited attention to relationships	Recognises several relationships but offers a mainly linear analysis	Explains important interdependencies, scales, feedback and possible consequences	Integrates multiple perspectives and time horizons, identifies leverage points and critically examines uncertainty
Ethical reasoning	Expresses a position without examining assumptions or consequences for others	Recognises an ethical issue and some affected perspectives	Weighs competing values, responsibilities and distributional effects to justify a position	Critically examines power, justice and excluded perspectives and develops a transparent, ethically defensible response
Collaboration	Participates inconsistently or relies heavily on others	Completes assigned tasks and contributes to group discussion	Shares responsibility, listens actively, manages differences and integrates contributions	Strengthens collective capacity, enables less-heard perspectives and uses disagreement constructively
Action competence	Suggests a general response with limited connection to evidence or context	Proposes a relevant response but gives limited attention to implementation	Develops an evidence-informed, feasible plan with responsibilities, resources and indicators	Co-creates and tests a response, adapts it through feedback and considers pathways towards sustained change
Critical reflection	Describes activities with little examination of learning	Identifies learning and some difficulties	Analyses assumptions, feedback, decisions and changes in understanding	Reframes the problem, recognises limitations and transfers learning to future professional or civic action

The descriptors should be contextualised through discipline-specific examples. In engineering, action competence may involve developing and testing a prototype. In economics, it may involve evaluating a policy mix. In teacher education, it may involve designing and reviewing a learning intervention. The underlying competence remains shared, while its expression reflects disciplinary practice.

Designing an Assessment Sequence

Assessment of sustainability competence is strongest when evidence is collected throughout the learning process.

Designing competence-based assessment

Eight decisions connecting learning outcomes, evidence and improvement

Align / Observe / Feedback / Refine

01

Clarify the intended competence

Define what students should demonstrate and connect it to the course learning outcomes.

What will competence look like?

02

Select an authentic task

Use a case, project, simulation or challenge that requires students to mobilise competence.

Where will learning be applied?

03

Identify the evidence

Choose products, performances, decisions and reflections that will demonstrate learning.

What evidence will count?

04

Share the criteria

Introduce the rubric early and discuss how its criteria apply to the task.

What does quality look like?

05

Create formative checkpoints

Build in feedback, self-assessment and opportunities to revise before final submission.

When can students improve?

06

Gather different perspectives

Invite peers, educators and external stakeholders to provide relevant feedback.

Whose perspective is needed?

07

Separate team and individual evidence

Combine the shared product with evidence of individual reasoning, contribution and reflection.

What did each learner contribute?

08

Use results to improve learning

Turn assessment findings into students' next steps and stronger future versions of the course.

What should happen next?

LEAF Sustainability Competence Assessment Tool

The **LEAF Sustainability Competence Assessment Tool** is an editable Excel resource that helps educators assess how learners apply sustainability knowledge through reasoning, collaboration, reflection and action. It includes a four-level rubric covering five interconnected competence areas: systems thinking, ethical reasoning, collaboration, action competence and critical reflection. Performance is described across four developmental levels, from *Emerging* to *Transformative*.

The workbook includes a detailed assessment form for individuals or teams, adjustable competence weights, selectable performance levels, automatic scoring, and dedicated fields for recording evidence, feedback and next steps. A cohort tracker supports repeated assessment across up to 40 records, while an automated dashboard displays average competence scores and the distribution of performance levels.

The tool can be adapted to projects, simulations, social hackathons, service-learning, community-based assignments and other authentic sustainability tasks. It combines assessment of the final product with evidence of students' reasoning, participation, contribution and learning development, supporting both formative feedback and summative judgement.

Visit the GreenUS Catalogue's page to download the tool.

Social Hackathon Sandbox

The **Social Hackathon Sandbox** is a reusable assessment and facilitation tool for short, challenge-based learning experiences focused on sustainability and community concerns. It enables educators to assess sustainability competences *as they are mobilised in practice*: when learners investigate a real issue, engage with different perspectives, question assumptions, work collaboratively, prototype possible responses, use feedback and decide what responsible action could follow.

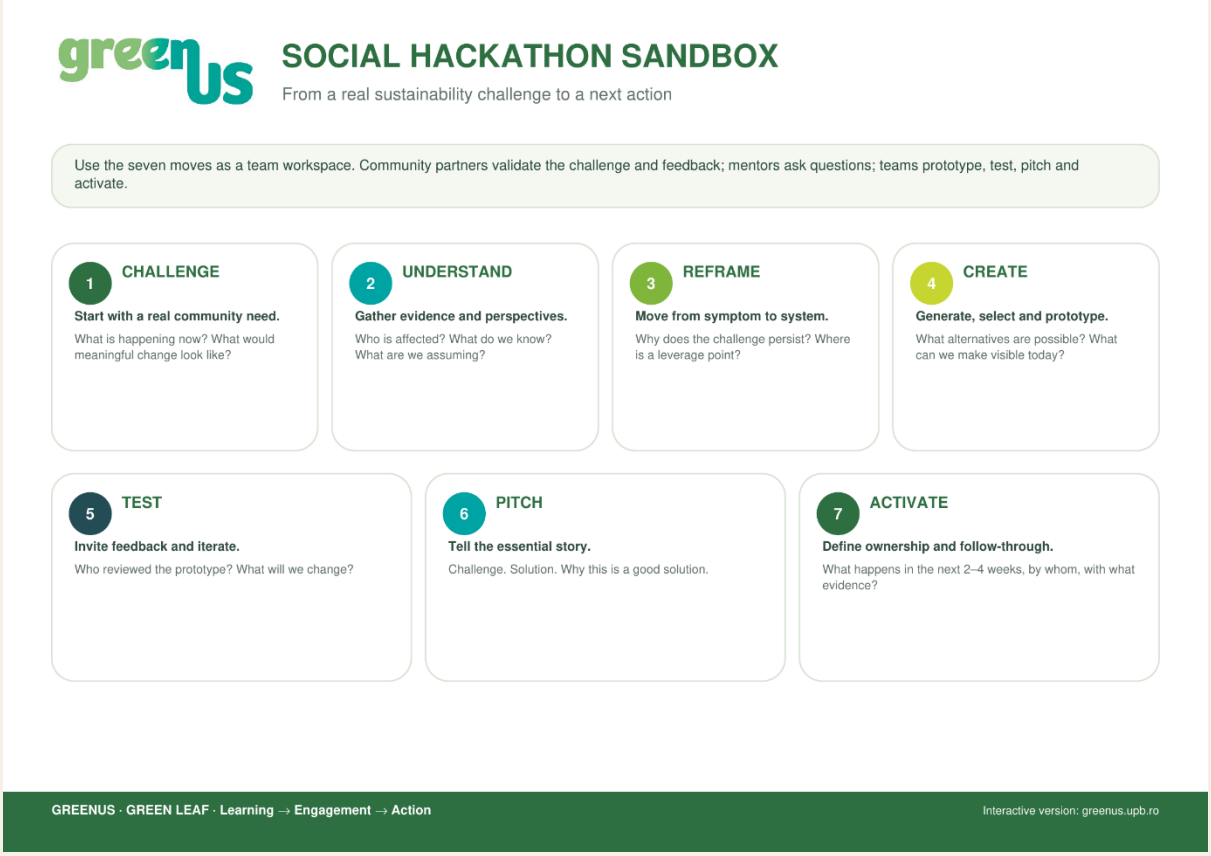
The sandbox starts from an important premise: the value of a social hackathon should not be judged only by whether a team solves a complex problem or produces a finished solution. Meaningful outcomes may include a better-articulated problem, a challenged assumption, stronger understanding of a community or system, a tested prototype, a new relationship, or a credible next step. This makes the hackathon particularly valuable for authentic assessment because both the learning process and its outputs become evidence of competence development.

The GREENUS sandbox takes teams through seven connected moves (see Figure 14):

CHALLENGE → UNDERSTAND → REFRAME → CREATE → TEST → PITCH → ACTIVATE

Figure 14

Connected phases in the social hackathon implementation



This guide outlines two distinct, highly adaptable models that institutions can utilize depending on their curriculum requirements: the **7-Move Model** and the **LEAF 6-Phase Model**.

Model 1: The GREENUS Social Hackathon Sandbox (7 Moves)

The 7-Move Model structure team collaboration around seven progressive "moves" that lead students systematically from understanding a real community challenge to initiating responsible post-event actions.

Move	Phase Name	Core Focus & Actionable Prompts
1	CHALLENGE	Start with a real community need. Prompts: - What is happening now? - What would meaningful change look like?
2	UNDERSTAND	Gather evidence and perspectives. Prompts: - Who is affected? - What do we know? What are we assuming?
3	REFRAME	Move from symptom to system. Prompts: - Why does the challenge persist? - Where is a leverage point for change?

Move	Phase Name	Core Focus & Actionable Prompts
4	CREATE	Generate, select, and prototype. Prompts: - What alternatives are possible? - What can we make visible today?
5	TEST	Invite feedback and iterate. Prompts: - Who reviewed the prototype? - What will we change after feedback?
6	PITCH	Tell the essential story. Prompts: - Deliver a compelling 4-minute final pitch detailing the challenge, the solution, and why it is a good solution.
7	ACTIVATE	Define ownership and follow-through. Prompts: - What happens in the next 2-4 weeks, by whom, and with what evidence of progress?

Facilitator Notes:

1. Before the Event (Preparation)

- Set the overarching theme and educational learning goals for the hackathon.
- Recruit challenge owners (NGOs, community groups, or local partners) who are vested in the outcomes.
- Establish interdisciplinary student teams (ideally 4-6 members) and brief the mentors and judges.
- Communicate the Code of Conduct and judging criteria in advance.

2. During the Event (Execution)

- Use the seven sandbox stages as temporal checkpoints for the teams.
- Incorporate at least two structured moments for community-partner contact and mentor feedback.
- Clarify the mentor's role: mentors act as coaches who ask questions to help teams self-correct, supporting functioning without dictating or taking over the solutions.

3. Team Outputs (The Deliverables)

At the close of the event, student teams must deliver three functional components:

- **A maximum 4-minute final pitch** answering: What is the challenge? What is our solution? Why is this a good solution?
- **A concise written Solution Brief / Annex Document** to be delivered directly to the community partner. This document contains more extensive information, links, and detailed research than the slide deck.
- **A prototype or demonstration** appropriate to the idea (e.g., mock-up, service wireframe, policy brief, campaign strategy, or a software demonstration).

4. Evaluation and Judging

- Form an international jury consisting of academics, NGOs, and sponsors.
- Evaluate solutions on a 1-5 scale across five standardized criteria: Creativity, Feasibility, Adaptability, Impact, and Pitch Quality.
- Involve community partners in the jury or in a separate usefulness and relevance validation check.

5. After the Event (Continuation and Reflection)

- Do not stop at awards. Establish a post-event continuation pathway.
- Agree on one feasible action for the following 2-4 weeks, specifying a named owner, the required support, and a progress indicator.
- Engage in structured reflection: ask participants what changed in their understanding of the challenge, the community, the system, and their capacity to act. Use this reflection as evidence of sustainability competence development.

Model 2: The LEAF Social Hackathon Sandbox (6 Phases)

The LEAF Sandbox is a highly reusable planning and facilitation tool designed specifically for short, challenge-based hackathons centered on sustainability and community concerns. It focuses heavily on deep issue-articulation, service-learning, and responsible project continuation.

The Six Phases

Phase 1: FRAME — Start with the issue, not the solution

- *The Issue:* Describe the condition, tension, or sustainability concern clearly.
- *Stakeholders:* Determine why it matters and to whom, identifying who experiences the immediate consequences.
- *Challenge Statement:* Formulate an open-ended "How might we... while... for/with... ?" statement.
- *Issue-Articulation Check:* Ensure participants can still question who defines the issue, what causes it, and which consequences count.

Phase 2: DISCOVER — Enter the issue before trying to fix it

- *Perspectives:* Map out who is involved, affected, missing, powerful, or overlooked.
- *Systems & Places:* Identify underlying policies, infrastructures, routines, institutions, and environments.
- *Lived Knowledge:* Determine what community and disciplinary knowledge is needed in the room.
- *Assumptions:* Explicitly write down assumptions that require active testing.
- *Reflection Stop #1:* What changed in our understanding of the issue after listening to others?

Phase 3: DEFINE — Choose what is worth acting on

- *Reframed Challenge:* Rewrite the challenge statement based on discoveries.
- *Desired Change:* Specify what should become different for people, communities, practices, or environments.
- *Design Principles & Constraints:* Establish principles (e.g., inclusive, low-resource, community-owned) and map key constraints (time, policy, cost, ethics).
- *Reciprocity Checkpoint:* Is there mutual benefit? Do partners actively influence decisions? Does lived community knowledge count?

Phase 4: DEVELOP — Make something that helps you learn

- *Intervention:* Describe the intervention idea clearly without overselling it.

- *Prototype Format:* Select an appropriate format (e.g., storyboard, service journey, policy concept, campaign, mock-up, data story).
- *Learning Goal:* State the key uncertainty the prototype is designed to help the team learn or resolve.
- *Reflection Stop #2:* Whose needs are easiest for our prototype to serve? Whose are hardest?

Phase 5: DELIVER — Pitch the learning, not only the product

- *50-Word Proposal*: Synthesise the project as: Issue -> Insight -> Intervention -> Value -> Next Test.
- *Evidence:* Provide clear evidence of the proposal's relevance, feasibility, and responsibility.
- *Pitch Panel:* Evaluate whether the team successfully reframed the issue, made community knowledge visible, and suggested a credible next step.

Phase 6: CONTINUE — Design the life after the hackathon

- *Stewardship:* Assign a specific next owner or steward (a person, team, or community partner).
- *Next Checkpoint:* Specify exactly when the next validation, decision, or test will occur.
- *Continuation Plan:* Commit to a realistic transfer, course integration, scaling, or responsible closure pathway.

The Facilitator Compass

To maintain high standards of social responsibility, facilitators should continually orient their design decisions using the four cardinal tenets of the **Facilitator Compass**:

1. Reciprocity (Who gives, who gains, who decides?): Focuses on mutual benefit, ensuring community partners influence decisions and their lived knowledge is respected.

2. Relevance (Is the issue real and situated?): Ensures the hackathon addresses actual, contextual community challenges rather than abstract, hypothetical problems.

3. Reflection (What are we learning and unlearning?): Fosters academic, civic, and values-based learning, transforming the sprint into a continuous process of self-reflection.

4. Responsibility (What happens after the sprint?): Mandates that while the 1-day event ends, the relationships, commitments, and care established do not dissolve.

Building the learning ecosystem

Part III focuses on the Engagement pillar of the GREEN LEAF framework and explains how higher education institutions can build the collaborative learning ecosystems needed to make curriculum greening meaningful, participatory and sustainable. While Part II addressed the design of green curriculum through learning outcomes, content integration, pedagogy and assessment, this chapter turns to the people, relationships and structures that enable such curricula to take root in institutional practice. Curriculum greening depends not only on what is taught, but also on who is involved, how they are supported, and how learning is connected to real systems of change.

The three steps in this chapter translate the Engagement pillar into a practical implementation pathway. Step 6, *Engage and Empower Educators*, focuses on the role of educators as key agents of curriculum transformation and shows how professional learning, peer collaboration and institutional recognition can strengthen their capacity to design and deliver sustainability-oriented learning. Step 7, *Build Strategic Partnerships*, extends the learning ecosystem beyond the institution by connecting curricula with municipalities, communities, civil society organisations, industry, policy actors and other stakeholders. Step 8, *Activate Green Learning Ambassadors*, places students at the centre of engagement by developing their leadership, peer-learning capacity and contribution to institutional sustainability transformation

06 Engage and Empower Educators

Purpose

The purpose of Step 6 is to ensure that educators are informed about curriculum greening and actively enabled to lead it. Curriculum transformation depends on the capacity, confidence and commitment of lecturers, programme teams, educational developers and academic leaders. This step therefore focuses on *creating the professional learning conditions* through which educators can understand sustainability competences, translate them into disciplinary practice, redesign learning experiences and participate in institutional change.

THIS SECTION / ENGAGEMENT PILLAR



Why educator engagement matters

Curriculum greening begins with educators. They make everyday decisions that shape what students learn, how learning takes place, and how sustainability is interpreted within different disciplines. Yet introducing sustainability into higher education is rarely a matter of individual motivation alone. Even highly committed educators often report uncertainty about where to begin, how sustainability relates to their discipline, or how to redesign existing courses without increasing curriculum overload.

For this reason, successful curriculum greening depends not only on providing resources but on creating an environment in which educators feel supported, connected, and recognised. Professional development, peer collaboration, access to practical tools, institutional leadership, and opportunities to experiment all contribute to building the confidence needed to integrate sustainability into teaching.

Within the GREEN LEAF Framework, engaging educators is therefore understood as a continuous process rather than a one-off training activity. Faculty development should enable educators to learn from one another, exchange ideas across disciplines, reflect on their teaching practices, and gradually build sustainability into their courses through iterative improvement.

What does educator empowerment look like?

Empowering educators means **creating conditions** that make sustainability integration both possible and rewarding. While every institution develops its own approach, successful initiatives typically combine several complementary strategies.

Practical implementation guidelines

- **Institutional mapping**

Start with a short institutional diagnosis before organising training. Use the GREEN LEAF Curriculum Greening Benchmarking Tool and the LEAF Mapper available through https://greenus.upb.ro/ to identify strengths, gaps and priority areas. A practical first output can be a one-page overview showing which programmes already include sustainability learning outcomes, which courses involve external stakeholders, and where educator support is most urgently needed.

- **Build sustainability literacy**

Educators first need opportunities to explore sustainability concepts, contemporary challenges, and competence frameworks such as GreenComp. The objective is not to turn every academic into a sustainability specialist, but to help them recognise how sustainability connects with their own discipline and professional context. This could be done in a 90-minute workshop, bringing together programme directors, educators and sustainability coordinators.

- **Support pedagogical innovation**

Faculty benefit from practical guidance on designing sustainability learning outcomes, integrating sustainability metaconcepts, adopting transformative pedagogies, and aligning assessment with sustainability competences. Workshops, curriculum design labs, mentoring, and practical toolkits can all support this process.

- **Build a community of practice**

Some of the most effective professional learning happens when educators work together. Communities of practice, interdisciplinary curriculum redesign workshops, peer observation, and collaborative course development create opportunities to exchange ideas, solve common challenges, and learn from successful practices across disciplines.

- **Recognise and reward engagement**

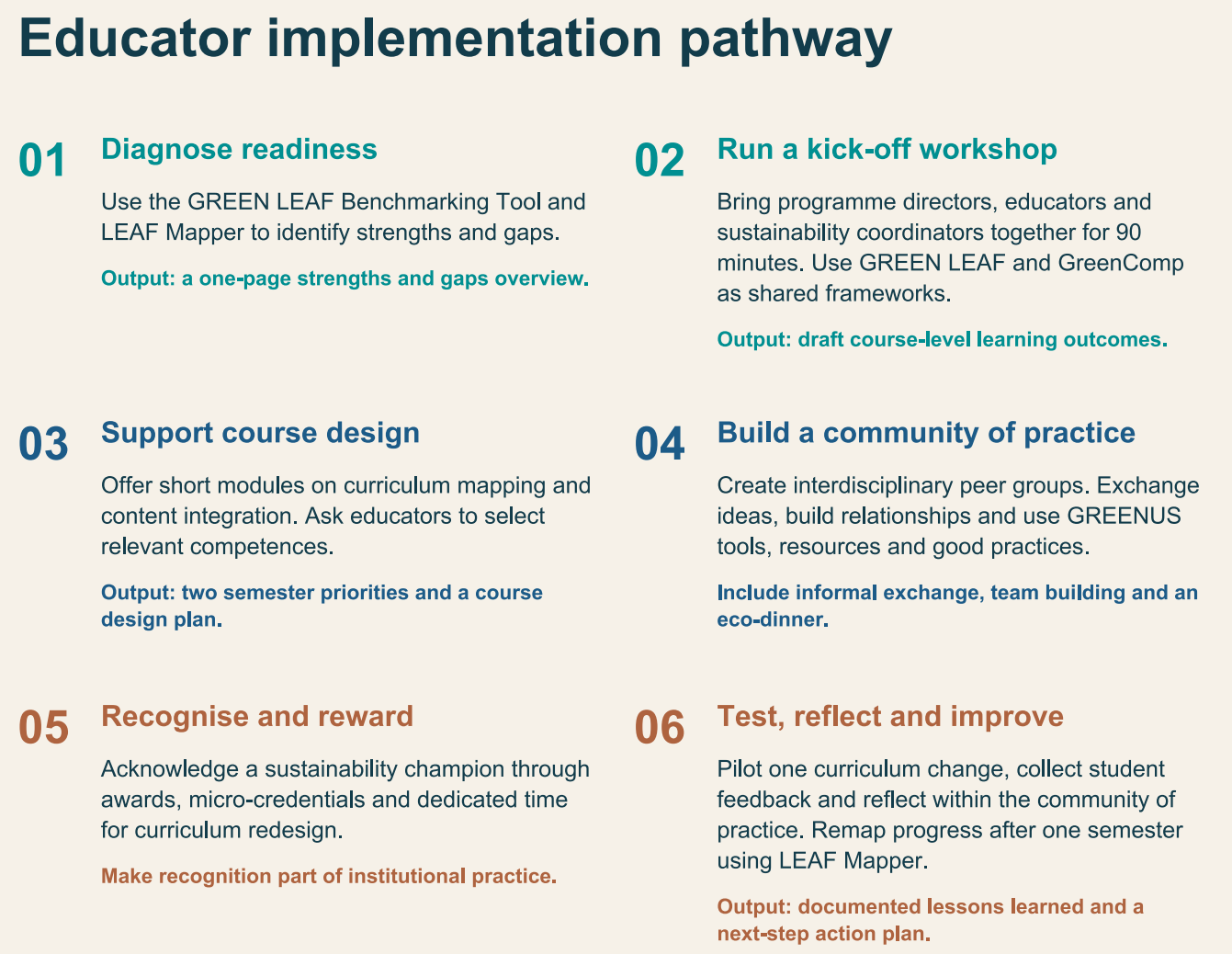
Curriculum transformation requires time and effort. Institutions can encourage sustained engagement by recognising contributions to sustainability education through teaching awards, promotion criteria, micro-credentials, internal funding, or dedicated time for curriculum redesign.

- **Create a culture of continuous improvement**

Curriculum greening is not completed after a single workshop or redesigned syllabus. Educators should be encouraged to view sustainability integration as an ongoing process of experimentation, reflection, feedback, and refinement. Small changes implemented consistently often lead to significant transformation over time.

The below figure is intended as a practical set-by-step route, summarizing the above listed implementation guidelines.

Figure 15
Practical implementation guidelines



From individual effort to institutional culture

Faculty development is most effective when it becomes part of the institution's culture rather than an optional activity. Sustainability champions can inspire change, but lasting transformation depends on creating structures that allow many educators, not only a few enthusiasts, to participate.

This means moving beyond isolated workshops towards **integrated support systems** that include institutional strategies, communities of practice, digital resource platforms, mentoring, leadership commitment, and opportunities for interdisciplinary collaboration. As more educators engage with sustainability, they become contributors to a shared learning ecosystem in which ideas, experiences, and resources circulate across departments and disciplines.

The examples presented in this section illustrate different ways in which higher education institutions have created environments that support educators throughout this journey. Although their approaches vary, they share a common objective: making sustainability education a collective endeavour rather than an individual responsibility.

Educator Empowerment with the Duurzaam Educatiepunt platform

The example in demonstrates how governmental support structures can engage educators through free training activities, peer exchange, networking opportunities, and practical toolkits. When educators are provided with concrete examples, curriculum design resources, and opportunities to learn from colleagues, sustainability integration becomes more accessible and less dependent on individual expertise.

Box 12.
Flemish Platform for Sustainable Education

The **Duurzaam Educatiepunt platform** *(Sustainable Education Platform)* offers **modular learning pathways, practical tools, and real-life examples** that help educators integrate sustainability into courses and curricula. It supports self-paced learning and provides concrete guidance for lesson design and curriculum development (Vlaamse overheid, n.d.).

Its value lies in making curriculum greening accessible to educators who may not yet identify as sustainability specialists.

The platform contributes to:

- **Learning**: by supporting competence-based sustainability education
- **Engagement**: by offering a community of practice
- **Action**: by providing tools to translate sustainability into curriculum design and institutional practice

Note
The Duurzaam Educatiepunt platform is currently maintained as an **archival resource** and is no longer updated following recent policy changes; materials remain accessible.

Publicly available tools can lower the threshold for engagement, but they require institutional uptake, active facilitation and continuous updating to remain effective.

CONNECT – A Digital Ecosystem for University-Industry Collaboration

The CONNECT Platform ( ) strengthens the relationship between curriculum, labour market needs and societal challenges. Educators can use external challenges as learning contexts, while students engage with real organisations and professional expectations.

Box 13
CONNECT: Building a Digital Ecosystem for University–Industry Collaboration

The **CONNECT** platform, developed by the National University of Science and Technology POLITEHNICA Bucharest, illustrates how digital infrastructures can strengthen collaboration between universities, students, educators, and external partners.

CONNECT creates a shared space where authentic challenges from industry and society become opportunities for learning, innovation, and knowledge exchange.

The platform connects thousands of students, hundreds of academic staff, and a large network of partner organisations, enabling the **co-creation of projects** that address real professional and societal needs.

Companies and organisations can propose project ideas, internships, research topics, and innovation challenges, while students gain access to authentic learning experiences that allow them to apply disciplinary knowledge in professional contexts. Educators use the platform to supervise interdisciplinary projects, facilitate collaboration with external stakeholders, and strengthen the connection between curricula and labour market needs.

The platform contributes to:

- **Learning**: authentic project-based experiences
- **Engagement:** by creating structured interaction between higher education and external stakeholders
- **Action**: by enabling innovation and implementation beyond the classroom

Learn more

Green Impact Teams at UCLL

Green Impact is a program that supports the creation of sustainable change in organisations around the world. It motivates employees to take action for positive socio-economic and ecological change, in the workplace and beyond. Teams of employees and students from any campus, faculty, department, service or building can participate in Green Impact.

Box 14
Sutainability coordinator and Impact Teams

Through '**Impact Teams'**, staff and students can become part of a UCLL-wide network to make the university more sustainable through bottom-up initiatives.

By combining **coordination, coaching, toolkits and recognition**, the model helps sustainability become part of institutional culture. Educators and students are not acting alone but within a visible and supported transformation ecosystem.

A reward system with an award for the most Impactful Teams is in place to engage students and staff.

Using an online toolkit (registration needed), every Impact Team can carry out concrete actions addressing socio-economic and environmental issues, aligned with the SDGs.

The Impact Teams, amongst other initiatives, are coordinated by a UCLL Sustainability Coordinator.

The platform contributes to:

- **Learning**: by encouraging sustainability-oriented teaching
- **Engagement:** by building a community of educators and students
- **Action**: by linking participation to institutional sustainability transformation.

Learn more (content in Dutch)

GLOBE STEAMSS Data Space and Community of Practice Hub

The **GLOBE STEAMSS Data Space and Community of Practice Hub** brings together an international network of educators, researchers, and innovators who are shaping the future of Science, Technology, Engineering, Arts, Mathematics, and Social Sciences (STEAMSS). The platform's core mission is to enable open, transdisciplinary collaboration, share high-quality open educational resources (OER), and facilitate the active co-creation of knowledge to drive global sustainability education.

The platform combines a Marketplace for Sustainability Education, where open learning materials can be shared and discovered; an Analytics Dashboard for exploring resource use, engagement and sustainability integration; and a Green Skills Repository that connects skills, competences, projects and initiatives.

Through its **Community of Practice** and **Design Challenge Events**, GLOBE STEAMSS also creates opportunities to exchange expertise, build partnerships and work together on sustainability challenges. A shared governance framework supports trusted and responsible participation while allowing contributors to retain control over their data. For curriculum greening, the data space offers a practical way to find resources, connect learning with wider communities and turn sustainability ideas into collaborative action.

Figure 16

Homepage of the GLOBECOP Hub

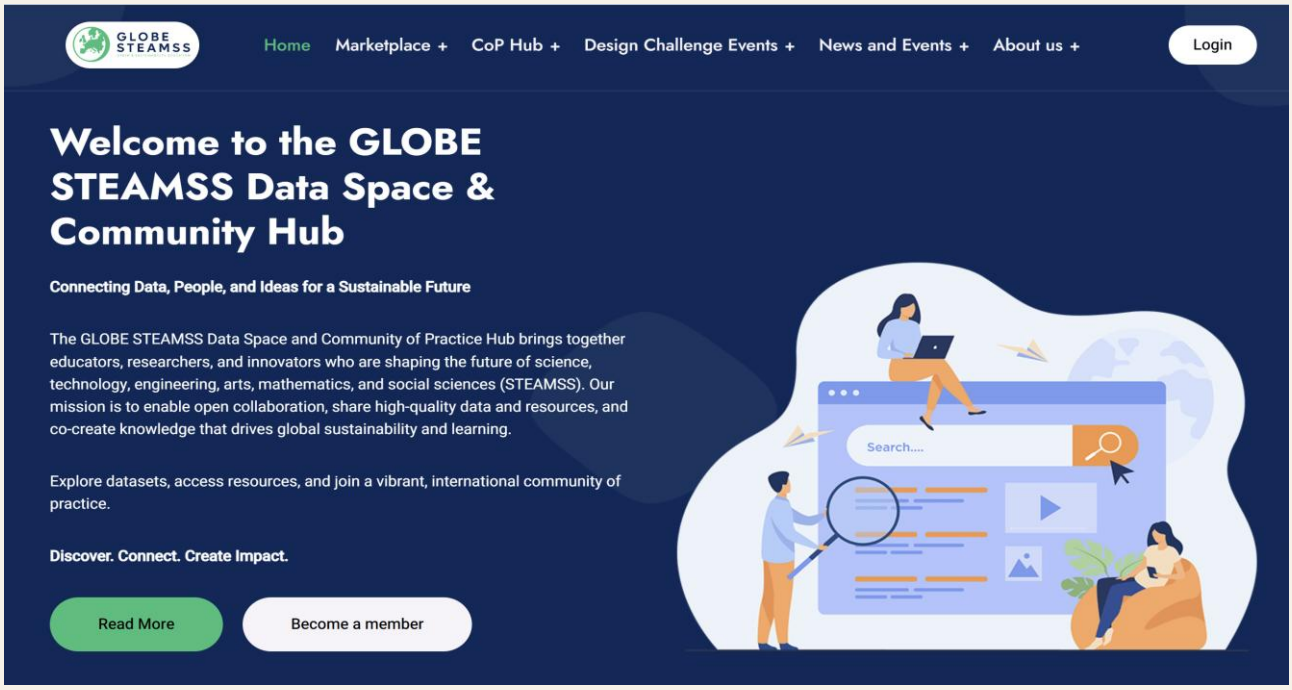
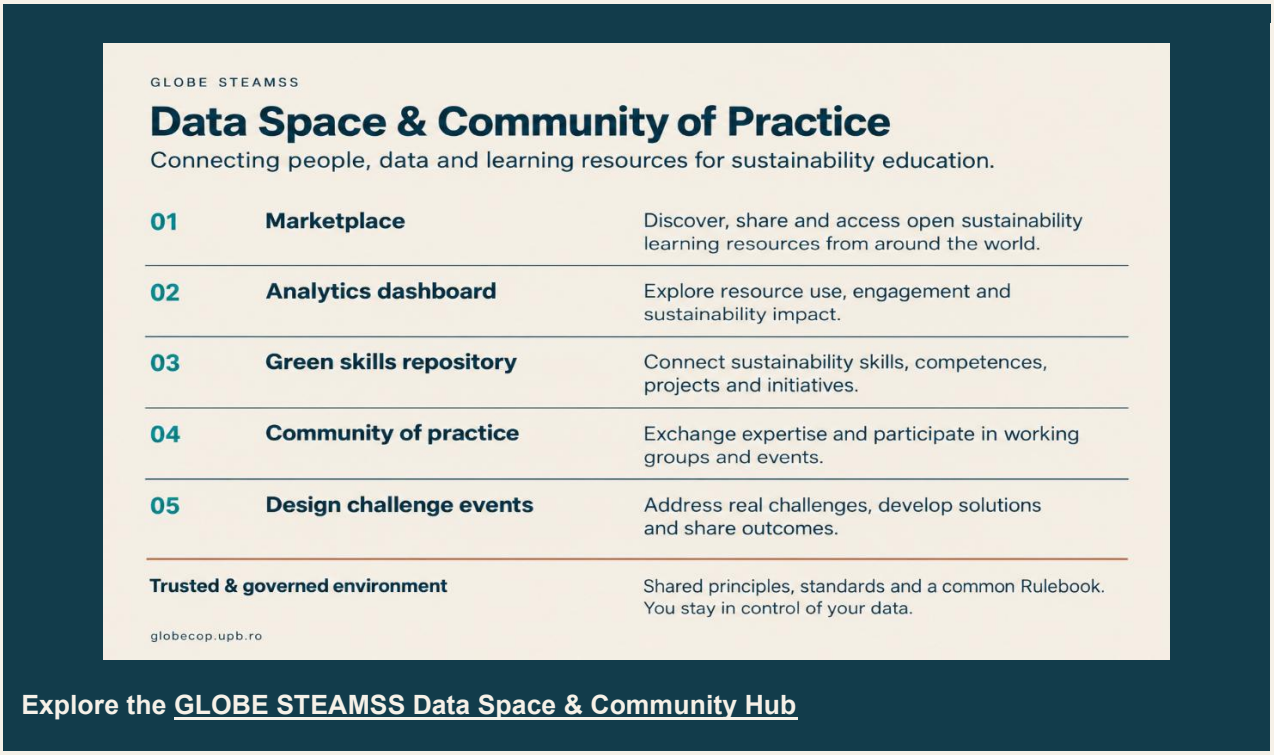


Figure 17

Building blocks of the GLOBE COP Data Space



Explore the GLOBE STEAMSS Data Space & Community Hub

SLIDE – Service-Learning and Digital Empowerment

The Erasmus+ **SLIDE project**[1] brings together service-learning, digital empowerment, inclusion and diversity to support more participatory and community-connected higher education. Its resources can help educators rethink how digital technologies are used in teaching while keeping learning connected to authentic social needs.

For educators, SLIDE offers practical pathways for developing digital pedagogy, designing service-learning experiences and creating more inclusive forms of student and community participation. Resources include a **Digital Empowerment MOOC for higher education teachers**, approaches for designing (e-)service-learning, an **Online World Café** for professional exchange, a European resource hub, and lessons learned from implementing service-learning and digital empowerment across different institutional contexts.

The project is particularly useful when curriculum greening is understood as a broader transformation of educational practice. It shows how educators can move beyond introducing sustainability content and create learning environments in which students work with communities, use technology purposefully, engage with questions of inclusion and develop their capacity to contribute to social change.

Explore the SLIDE Virtual European Hub

SERVICE-LEARNING INCLUSION DIVERSITY & DIGITAL EMPOWERMENT

[1] In 2026 SLIDE was recognised as an Epos Success Story, a quality distinction for Erasmus+ projects receiving an evaluation score above 90%.

07 Build Strategic Partnerships

Purpose

The purpose of Step 7 is to connect curriculum greening with real systems of practice, policy, community life, innovation and transition. Strategic partnerships enable higher education institutions to move beyond classroom-based sustainability learning by creating authentic contexts in which students and educators collaborate with municipalities, NGOs, industry, civil society organisations, schools, cultural actors and policy stakeholders.

THIS SECTION / ENGAGEMENT PILLAR



Why building partnerships matters for curriculum greening

Sustainability learning becomes impactful when it is embedded in **real systems**. Sustainability challenges are situated in complex social, ecological, economic and political systems. They cannot be fully understood through academic knowledge alone. Partnerships give students access to real problems and multiple stakeholder perspectives. They also help institutions ensure that curriculum greening contributes to societal relevance and local transition processes across sectors.

By strengthening relationships between universities and their wider environment, partnerships **create opportunities** for challenge-based learning, knowledge exchange, community engagement, and societal impact.

Practical guideline

- **Develop long-term, multi-actor partnerships**
- **Connect curricula to real-world challenges and systems**

Focus on:

- collaboration with local communities and organisations
- integrating learning in real-life projects (living labs, community work)
- engaging international and cross-sector networks
- co-creation with stakeholders, including learners and citizens

The following flow chart serves as a guideline for institutions and educators on how to map, prioritise, define, evaluate and build long-term partnerships.

Build purposeful partnerships

01

Map partners

Map existing and potential partners by expertise, sustainability relevance, educational value and capacity for collaboration. Create an institutional partnership register and assign coordination responsibilities.

02

Prioritise partnerships

Connect partnerships directly to programme learning outcomes and sustainability competences. Use learning outcomes and GREEN LEAF competences as selection criteria.

03

Define roles

Clarify roles and expectations early for students, educators, coordinators and external stakeholders. Use memoranda of understanding for longer-term collaborations.

Sustain the partnership ecosystem

01

Design learning activities

Build activities around authentic challenges proposed by students and/or partners. Co-design the objectives and build in reflection and evaluation.

02

Evaluate

Check that partnerships remain meaningful and mutually beneficial. Use reflection and evaluation to guide the next cycle.

03

Build the ecosystem

Move gradually from isolated collaborations towards a structured institutional partnership ecosystem.

From institutional culture to partnerships

The examples below illustrate different partnership models: institutional hubs, community spaces, city-wide ecosystems, urban living labs and co-created learning communities. Together, they can serve as an inspiration on how strategic partnerships can make sustainability learning more authentic, systemic and action-oriented.

Good practices: connecting curricula to real systems

Curriculum greening becomes tangible when learning moves into the places, partnerships and systems where sustainability challenges are being addressed. The examples below (-) show different ways of creating these connections: through community hubs, learning ecosystems, living labs and co-created university–community programmes. They differ in scale and organisation, but share a common principle: **students and educators learn with external actors while contributing to questions that matter beyond the classroom**.

Box 15
UCLL Social Tech Hub



Technology and wellbeing meet in a collaborative ecosystem

Box 15
UCLL Social Tech Hub

The UCLL Social Tech Hub connects education, research, technology and the wellbeing sector. Students and educators work with researchers, companies and community organisations on societal challenges related to wellbeing and inclusion. Community projects, living labs and co-creation formats allow curricula to remain connected to emerging needs and professional practice.

How it connects curriculum to real systems: Students and educators work directly with external partners on authentic challenges, bringing community knowledge, technological expertise and educational practice into the same learning environment.

LEAF connection:

Learning — experiential and community-connected learning ·

Engagement — sustained partnerships across sectors ·

Action — co-developed responses to societal challenges

Learn more (content in Dutch)

Box 16
Campus Corso

CAMPUS CORSO

Durven Dromen. Samen Doen.**Learning, entrepreneurship and community in a shared space**

Campus Corso is a community-driven learning space in Leuven where students, educators, citizens and organisations meet around educational, entrepreneurial and social initiatives. It provides a physical setting in which formal learning can connect with everyday community life.

In practice: a student-run community hair salon

Through a partnership with a local secondary school, hairdressing students work with real clients and take responsibility for service organisation and client interaction. The community gains access to affordable services, while students develop professional competences in an authentic social environment.

LEAF connection
Learning — authentic professional experience ·

Engagement — interaction with local communities and organisations ·

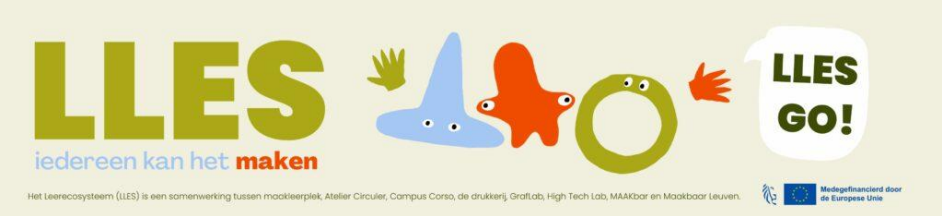
Action — students contribute directly to a community service

Box 16
Campus Corso

Learn more

Box 17
Leuven Learning Ecosystem (LLES)

Connecting formal, informal and community learning



The Leuven Learning Ecosystem brings together educational institutions, community organisations, maker spaces and other local actors across a city-wide network of learning environments. Making, repairing and circular production become opportunities for learning while contributing to wider sustainability transitions.

In practice: Herstelhub Textile

The textile repair hub collaborates with social enterprise Vites to repair slightly damaged second-hand clothing instead of discarding it. The initiative shows how circular practices, social enterprise and community learning can intersect in a local ecosystem.

LEAF connection
Learning — learning through making and community practice ·

Engagement — connections across educational and community organisations · Action — circular practices are tested and embedded locally

Learn more

Box 18
Leuven 2030 Urban Living Lab

The city as a learning environment

LEUVEN2030
URBAN LAB

MOBILISING RESEARCH & EDUCATION
TO ACCELERATE CLIMATE TRANSITION

POWERED BY

imec leuven KU LEUVEN UCLL HOGESCHOOL

The Leuven 2030 Urban Living Lab connects students, researchers, public authorities, citizens and organisations around ongoing urban sustainability transitions. Students encounter sustainability as an interconnected environmental, social, economic and policy challenge and contribute to work already taking place across the city.

In practice: students contributing to Leuven's sustainability transition
KU Leuven students used neighbourhood safaris and circular storytelling to investigate real urban challenges. Breaking Ground for Nature explored biodiversity and water resilience through nature-based solutions, while Storytelling for Shaping Circular Cities examined barriers and opportunities for circular behaviour among international students.

LEAF connection

Learning — experiential and challenge-based learning ·

Engagement — collaboration with city and community actors ·

Action — student inquiry contributes knowledge and ideas to local sustainability transitions

Learn more

Box 19
University of Galway

Co-creating sustainable learning communities



The University of Galway example brings university educators and rural communities together to co-create sustainability learning. Academic knowledge is combined with local knowledge and lived experience, while blended formats and rural digital hubs make participation possible beyond the university campus.

How it connects curriculum to real systems
Community partners help shape the learning experience and the sustainability questions being explored. Learning therefore develops through dialogue between different forms of expertise and responds to locally meaningful concerns.

LEAF connection
Learning — place-based, transdisciplinary and collective learning ·
Engagement — co-creation and university–community partnership ·
Action — knowledge is developed around locally relevant sustainability concerns

Learn more

LEAF Partnership Design Studio

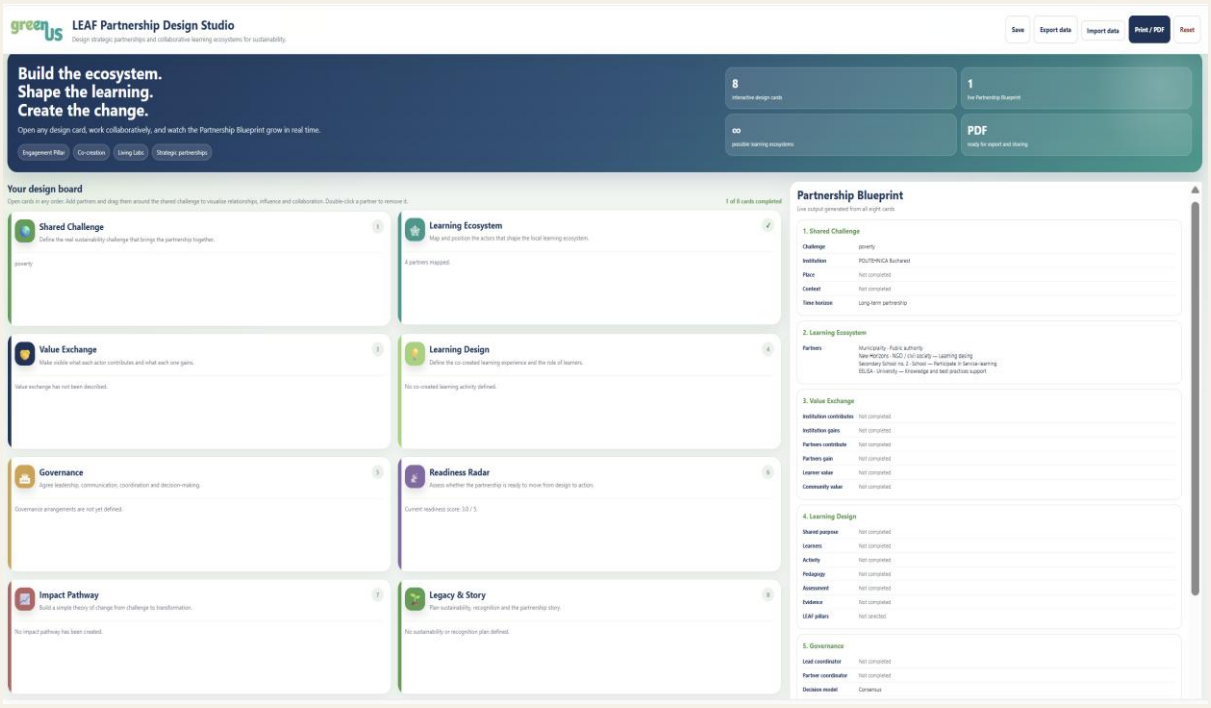
Curriculum greening extends beyond individual programmes and classrooms. Many sustainability challenges require collaboration across institutional boundaries, bringing together universities, schools, public authorities, businesses, civil society organisations, cultural institutions, and local communities to co-create learning experiences that respond to authentic societal needs. Developing these partnerships, however, requires more than identifying potential collaborators. Effective partnerships depend on a shared vision, clearly defined roles, reciprocal value creation, transparent governance, and mechanisms that sustain collaboration over time.

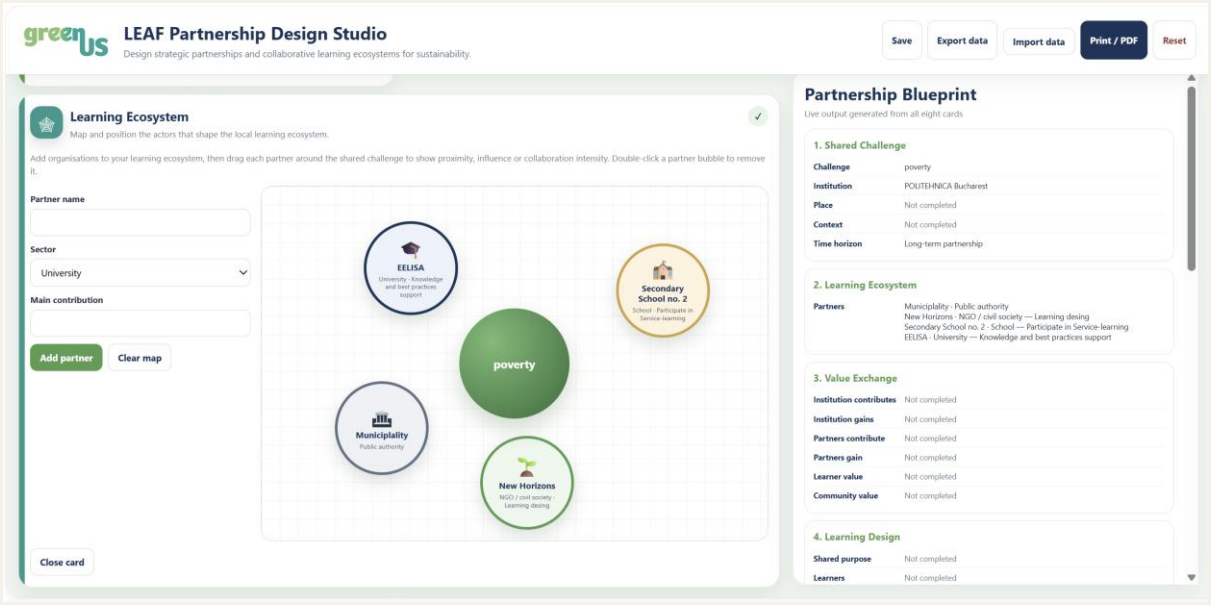
The **LEAF Partnership Design Studio** supports institutions in designing strategic partnerships that contribute to curriculum greening while strengthening local learning ecosystems. The studio adopts a collaborative design perspective in which stakeholders jointly define sustainability challenges, identify complementary expertise and resources, co-design learning opportunities, and establish the structures needed for long-term collaboration.

Organised around *eight interactive design cards*, the studio guides users through the successive stages of partnership development. Participants begin by defining the shared sustainability challenge and mapping the organisations that constitute the learning ecosystem. They then explore the reciprocal value created through collaboration, co-design learning activities aligned with the LEAF Framework, establish governance and communication arrangements, assess partnership readiness, develop an impact pathway, and plan mechanisms for sustainability, recognition, and future development. Throughout the process, the tool automatically generates a *Partnership Blueprint* that documents decisions and provides a structured implementation plan.

The studio is designed to facilitate collaborative planning workshops involving educators, programme leaders, sustainability coordinators, students, institutional managers, and external stakeholders. It can support the design of Living Labs, service-learning initiatives, challenge-based learning projects, community partnerships, and other forms of collaborative sustainability education.

Visit the GreenUS Catalogue's page to download the Design Studio





Box 20
When to use the Partnership Design Studio Tool

Use this tool when establishing new partnerships for curriculum greening, redesigning existing collaborations, planning Living Labs or community-engaged learning initiatives, developing sustainability projects with external stakeholders, or facilitating partnership co-design workshops. The studio is particularly valuable during programme development, institutional greening strategies, and project planning, where multiple actors need to build a shared vision and agree on responsibilities before implementation begins.

08 Activate Green Learning Ambassadors

Once institutional priorities have been identified, the next step is to establish a network of **Green Learning Ambassadors** who will support the implementation of curriculum greening across the institution. Ambassador networks provide a practical mechanism for extending ownership beyond project teams and sustainability offices by engaging educators, students, professional staff, and institutional leaders in driving institutional change. Rather than acting as isolated champions, ambassadors create connections across disciplines, facilitate peer learning, encourage collaboration, and help embed sustainability into everyday educational practice.

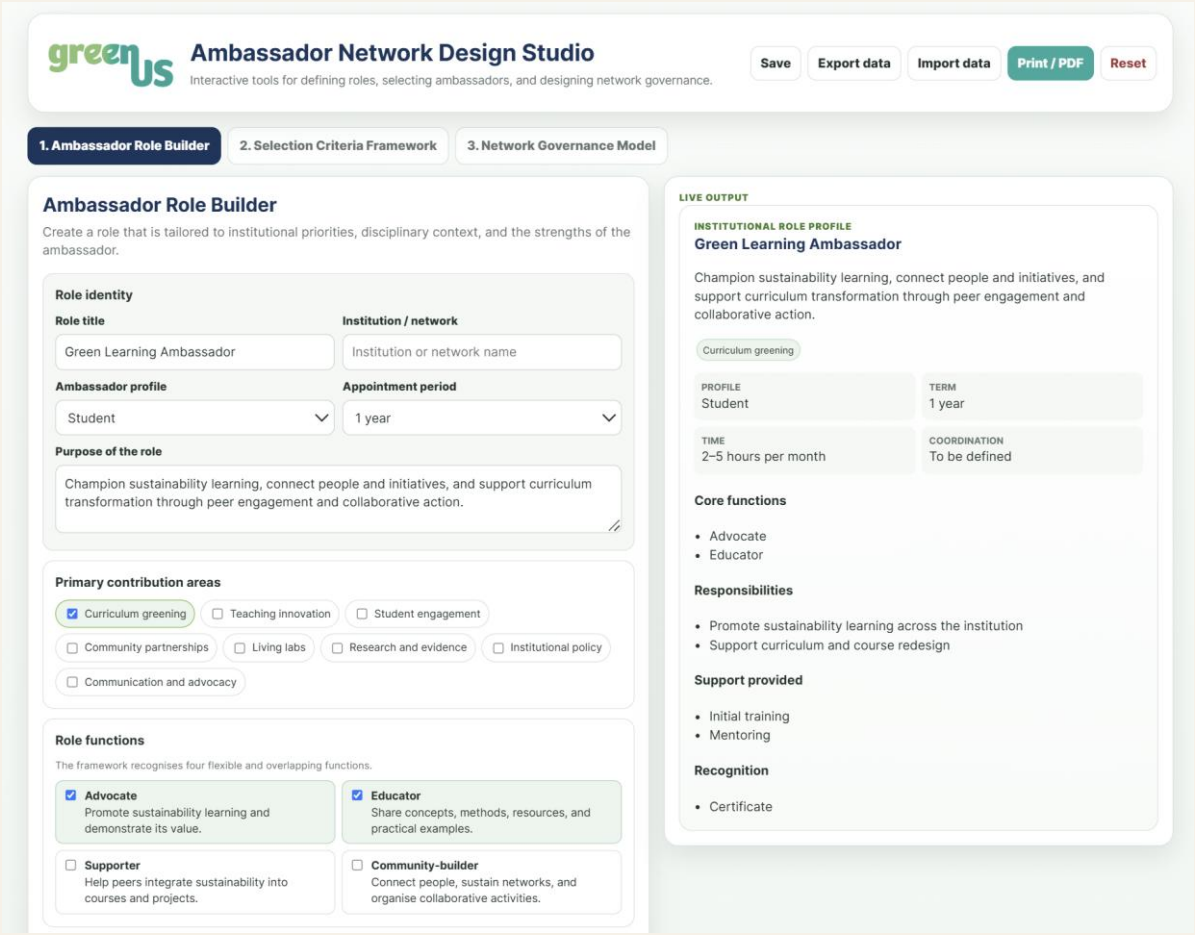
The network should be designed to reflect the institutional context, ensuring a balanced representation of disciplines, organisational units, and stakeholder groups. Decisions regarding ambassador profiles, recruitment procedures, responsibilities, communication channels, and governance arrangements should be developed collaboratively before recruitment begins. The **Ambassador Network Design Studio** supports institutions throughout this planning phase by providing a structured environment for defining ambassador roles, establishing transparent selection criteria, and designing governance models that align with institutional priorities (see Figure 18).

THIS SECTION / ENGAGEMENT PILLAR



Figure 18

Interactive interface of the Ambassador Network Design Studio for defining ambassador roles, selection criteria, and network governance



Following recruitment, ambassadors should be supported through structured opportunities for collaboration, peer exchange, mentoring, and participation in institutional greening activities (e.g.,).

Box 21

***Dreaming Sustainable Futures with the SDG Cards.* Example of an ambassador-led engagement activity**

Green Learning Ambassadors can use the *Printable Sustainable Development Goals Cards* developed by Participate to facilitate an interactive workshop that introduces participants to the Sustainable Development Goals while encouraging collaboration, systems thinking, and civic engagement.

After a short introduction to the 17 SDGs, participants are divided into small groups and presented with a real sustainability challenge relevant to their institution or community (e.g., reducing food waste on campus, improving biodiversity, promoting sustainable mobility, or supporting student wellbeing).

Using the *Dream Team* activity, each group selects four or five young changemakers featured on the cards whom they believe would be best equipped to address the challenge. Participants discuss the perspectives, skills, values, and competences that each individual contributes and explain why this combination would be effective. The activity concludes with groups reflecting on which GreenComp competences are represented in their teams and how they, as Green Learning Ambassadors, could develop similar competences to lead sustainability initiatives within their own institutions.

Box 21
Dreaming Sustainable Futures with the SDG Cards. **Example of an ambassador-led engagement activity**

Visit the GreenUS Catalog to download the cards

Establishing regular meetings, creating spaces for sharing practice, and recognising ambassadors' contributions help maintain engagement throughout the implementation process.

Box 22
Practice Spotlight: Living Labs for Engaging Local Learning Ecosystems

Living Labs are collaborative learning environments where education, research, innovation, and community action come together to address authentic challenges in real-world settings. Unlike classroom simulations, Living Labs position learners, educators, researchers, public authorities, businesses, and civil society organisations as equal partners who jointly identify problems, co-design solutions, test new ideas, and reflect on their impact. Learning therefore becomes embedded in ongoing social and institutional processes rather than being separated from them.

Within sustainability education, Living Labs represent one of the most comprehensive forms of community-engaged learning because they connect curricula with local systems and enable long-term collaboration among multiple stakeholders. They strengthen the relationship between universities and their surrounding communities while helping learners develop systems thinking, collaboration, civic engagement, and action competence through participation in authentic sustainability transitions.

The **DECITEL Teacher Academy** adopts this approach to engage Local Learning Ecosystems (LLEs) as collaborative spaces for teacher education. Rather than viewing schools, municipalities, NGOs, cultural organisations, teacher education institutions, and community groups as external partners, the Academy positions them as members of a shared learning ecosystem. Through Living Labs, these actors collaboratively identify local educational challenges, design innovative teaching approaches, experiment with digital and pedagogical solutions, and evaluate their impact on teaching and learning. Participatory workshops, co-design sessions, classroom experimentation, and structured reflection enable knowledge to circulate across institutional boundaries while ensuring that innovations remain grounded in local needs.

Learn more

As ambassadors begin their activities, documenting experiences and collecting evidence becomes an important component of both professional learning and institutional development. Recording initiatives, reflections, examples of practice, partnerships, and emerging outcomes enables ambassadors to monitor their own development while generating evidence that can inform quality assurance, accreditation, institutional reporting, and future curriculum redesign. The **Ambassador Journey Portfolio** provides a structured format for documenting this ongoing work throughout the implementation period and supports continuous reflection on contributions across the Learning, Engagement, and Action pillars of the LEAF Framework.

Recognition represents the final stage of the ambassador journey and plays a crucial role in sustaining long-term engagement. Although many ambassadors are motivated by a commitment to sustainability, formal recognition reinforces the value of their contribution, increases the visibility of sustainability leadership, and encourages wider participation across the institution. Recognition may take multiple forms, including digital badges, professional development certificates, awards, public acknowledgement at institutional events, opportunities to present successful practices, or consideration within promotion and career development processes. The **GREENUS Ambassador Certificate Generator** supports this recognition process by enabling institutions to create personalised certificates that acknowledge ambassadors' roles, contribution areas, appointment periods, and institutional affiliation (Figure 19). Used alongside the Ambassador Journey Portfolio, the certificate provides tangible recognition of individual achievements while documenting participation in institutional sustainability initiatives.

Figure 19

Interactive interface of the GREENUS Ambassador Certificate Generator for recognising and documenting the contributions of Green Learning Ambassadors



Ambassador networks should remain closely connected to curriculum redesign, pedagogical innovation, quality assurance processes, institutional sustainability strategies, and local partnerships. When integrated in this way, Green Learning Ambassadors become catalysts for organisational learning, helping institutions translate strategic commitments into sustained educational practice while strengthening the Engagement Pillar of the LEAF Framework.

Ambassador Network Design Studio: An Interactive Tool for Building Institutional Sustainability Ambassador Networks

Within the **LEAF Framework**, curriculum greening is recognised as a collaborative process that depends on people, relationships, and shared leadership. Sustainable transformation extends beyond individual courses or isolated initiatives and becomes embedded in the everyday practices of the institution. The *Engagement Pillar* therefore focuses on building communities of practice that connect educators, students, professional staff, institutional leaders, and external partners around a common vision for sustainability.

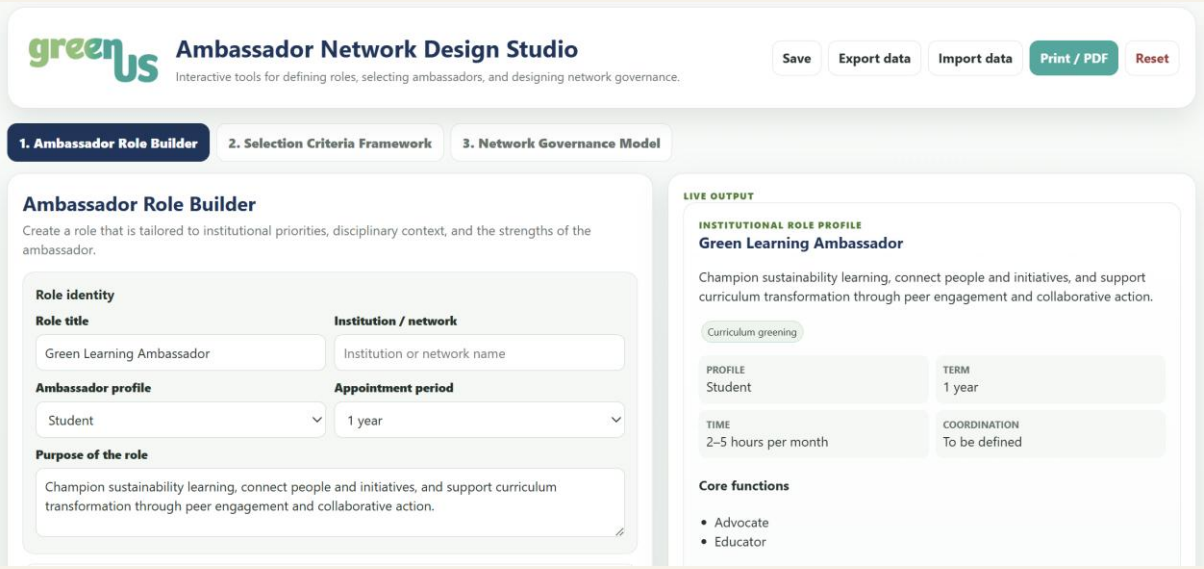
A Sustainability Ambassador Network provides the structure through which this vision can be realised. Ambassadors foster dialogue, encourage collaboration, support curriculum innovation, and create opportunities for peer learning across disciplines and organisational levels. Their contribution lies in connecting people, sharing expertise, facilitating change, and helping sustainability become an integral part of institutional culture.

The **Ambassador Network Design Studio** supports institutions in creating an ambassador network that reflects their strategic priorities, organisational context, and existing strengths. Through a guided and collaborative design process, participants define the purpose of the network, identify the profiles of ambassadors, establish transparent selection criteria, clarify roles and responsibilities, and develop governance mechanisms that support long-term engagement and continuous development.

Outputs

- Sustainability Ambassador Network blueprint
- Ambassador role profiles and competence framework
- Selection and recruitment framework
- Governance and coordination model
- Communication and engagement plan
- Recognition and professional development strategy
- Institutional implementation roadmap aligned with the Learning, Engagement, and Action pillars of the LEAF Framework

Visit the GreenUS Catalogue's page to download the Design Studio



Ambassador Journey Portfolio

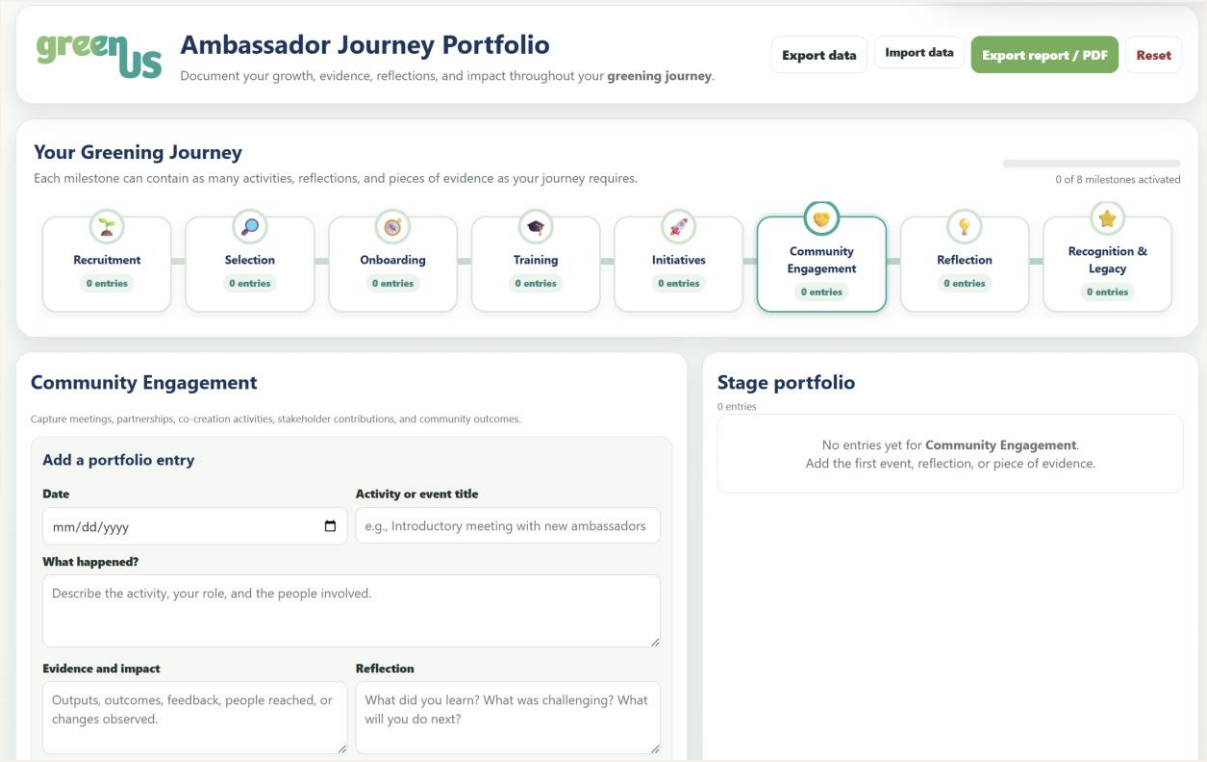
The **Ambassador Journey Portfolio** is an interactive digital portfolio that supports sustainability ambassadors in documenting, reflecting on, and communicating their contribution to institutional greening. Developed within the GREENUS project and aligned with the **LEAF Framework**, the portfolio accompanies ambassadors throughout their journey, capturing not only what they do but also how their experiences contribute to the *Learning*, *Engagement*, and *Action* pillars.

Organised around a visual journey map, the portfolio follows the key stages of the ambassador experience—from recruitment and onboarding to training, project implementation, community engagement, reflection, and recognition. Each milestone can include multiple portfolio entries, allowing ambassadors to document activities as they occur throughout the programme. For every activity, users can describe the event, record reflections, identify its contribution to the LEAF pillars, and upload supporting evidence such as photographs, presentations, reports, certificates, videos, or other documents. In this way, the portfolio becomes a living record of learning, collaboration, and impact that evolves over time.

The tool supports both individual reflection and institutional learning. Ambassadors are encouraged to revisit previous entries, identify patterns in their development, celebrate achievements, and set new goals for future engagement. At the same time, institutions can use the portfolio to monitor participation, showcase good practices, and collect evidence of the ambassador programme's contribution to curriculum greening and sustainability transformation.

The portfolio automatically organises evidence into a structured and visually engaging format. Individual entries can be combined into a comprehensive portfolio that highlights activities, partnerships, reflections, achievements, and impact. These outputs can be embedded within institutional or project websites, providing dynamic ambassador profiles or stories of practice, or exported as reports to support project documentation, quality assurance, accreditation processes, dissemination activities, and reporting.

Visit the GreenUS Catalogue's page to download the Journey Portfolio



Implementing institutionally

The previous parts of this manual have addressed how to design green curricula (**Learning Pillar**) and how to build the collaborative ecosystems that make sustainability education possible (**Engagement Pillar**). Part IV focuses on the third pillar of the GREEN LEAF model: **Action**.

In GREEN LEAF, Action begins when learning and engagement lead to something beyond the learning experience itself. This may take the form of a student project developed with a community partner, an intervention, a prototype, a proposal for change, or a new practice tested within a course or programme. At institutional level, *Action* also means creating the conditions for promising practices to continue, develop and become part of the way the university works.

This is particularly important because even well-designed green curricula can remain fragile, isolated or dependent on individual champions if they are not supported by institutional structures. A persistent challenge in higher education is the gap between recognising sustainability as a strategic priority and embedding it in educational practice, governance and quality assurance. Moving beyond individual initiatives therefore requires attention to institutional strategy, decision-making processes, resources and mechanisms that support continuity.

Part IV concentrates on this *institutional dimension of Action*. It addresses two complementary processes*: institutional alignment (Step 9)* and *monitoring and evaluation of impact (Step 10)*. Step 9 considers how curriculum greening can be connected with institutional priorities, governance, quality assurance and resource allocation. Step 10 asks what changes these efforts produce, how those changes can be documented, and what can be learned from both progress and difficulties.

Together, the two steps help institutions move from experimentation towards more sustained practice. Monitoring and evaluation are therefore not treated only as mechanisms for demonstrating results. They also provide feedback for deciding what should be maintained, adapted, extended or reconsidered as curriculum greening continues.

09 Institutional Alignment

The purpose of institutional alignment is to prevent the green curriculum from remaining isolated, i.e. a peripheral addition to the academic offer rather than an integral expression of the institution's values, priorities, and governance. Curriculum greening that is not anchored in institutional structures, policy frameworks, and strategic planning will always be vulnerable to changes in personnel, funding cycles, and institutional priorities.Institutional alignment means connecting sustainability in teaching and learning to the wider organisational ecosystem of the university: its mission and strategic plan, its governance bodies, its quality assurance processes, its accreditation requirements, its resource allocation decisions, and its public accountability mechanisms. When this alignment is achieved, sustainability ceases to be a curricular addition and becomes part of how the institution understands and exercises its educational responsibility.

International evidence consistently demonstrates that sustainability transformation in higher education cannot be sustained through bottom-up initiatives alone. UNESCO's Greening Curriculum Guidance (2024b) emphasizes that whole-institution approaches are essential to ensure that sustainability becomes embedded across teaching, governance, campus operations, and community partnerships simultaneously. The Greening Education Partnership, launched at the 2022 Transforming Education Summit, similarly calls for coordinated, system-wide action rather than fragmented individual efforts.

THIS SECTION / ACTION PILLAR



Institutional alignment is also critical for equity. Without structural support, sustainability integration tends to concentrate in certain disciplines or departments — particularly those with individual faculty champions — while remaining absent from others. Structural embedding ensures that all learners, regardless of their field of study, have access to sustainability learning opportunities.

Institutional alignment for curriculum greening operates across four interconnected dimensions.

1. Linking curriculum to institutional sustainability strategy

The green curriculum does not exist in isolation from the institution's broader sustainability commitments. Universities are increasingly adopting sustainability strategies, climate neutrality roadmaps, SDG alignment frameworks, and public accountability reports. Curriculum greening should be explicitly referenced and supported within these strategic documents.

This means:

- including curriculum greening as a named priority in the institutional sustainability strategy, alongside operational measures such as energy management or waste reduction;
- aligning learning outcomes and programme objectives with the institution's stated SDG contributions, particularly SDG 4 (Quality Education), SDG 13 (Climate Action), and SDG 17 (Partnerships for the Goals);
- referencing the green curriculum in public-facing institutional communications, including annual reports, accreditation documentation, and external rankings submissions.

Leal Filho et al. (2023) recommend that institutions incorporate explicit references to the SDGs in strategic plans and outline concrete methods and resource allocation for achieving them. Without this connection, sustainability strategies and educational strategies risk developing in parallel rather than reinforcing one another.

2. Governance integration

Effective governance is the structural backbone of institutional alignment. Sustainability cannot be coordinated informally or rely on the goodwill of individual actors. Higher education institutions that have successfully embedded sustainability in their curricula have typically established clear governance mechanisms that provide oversight, continuity, and accountability.

Key governance elements include:

- **a dedicated sustainability governance structure**: this may take the form of a sustainability office, a green office, a vice-rectoral position for sustainability, or a cross-functional sustainability committee;
- **a cross-functional steering group for curriculum greening**: this body brings together representatives from academic affairs, faculty development, student services, quality assurance, and operational sustainability to coordinate implementation and resolve structural barriers;
- **clear mandates and responsibilities**: governance bodies need defined roles, institutional mandates, sufficient resources, and mechanisms for reporting progress to senior leadership;
- **faculty recognition and incentive systems**: governance structures should include mechanisms for recognising and rewarding sustainability teaching innovation, including through promotion criteria, teaching awards, and dedicated funding for curriculum redesign.

Robinson et al. (2023) highlight the importance of reconciling academic and operational cultures within whole-institution sustainability governance, noting that bridging these two institutional spheres requires deliberate structural design rather than ad hoc coordination.

3. Policy alignment and accreditation links

Curriculum greening gains institutional legitimacy when it is supported by explicit policy frameworks that embed sustainability into the formal regulatory and quality assurance environment of the university.

This involves:

- **curriculum policy**: revising curriculum development guidelines to require sustainability impact assessment as part of programme approval and review processes, ensuring that new programmes and courses engage with sustainability from the outset;
- **learning outcomes policy**: embedding sustainability competences, drawing on frameworks such as the European GreenComp framework (Bianchi et al., 2022), as institutional graduate attributes applicable across all programmes;
- **accreditation and quality assurance**: engaging with national and sectoral accreditation bodies to include sustainability as an explicit quality criterion. Institutions involved in European university alliances, Erasmus+ networks, or professional accreditation schemes should advocate for the inclusion of sustainability standards within these frameworks;
- **HR and professional development policy**: establishing formal commitments to faculty development in sustainability pedagogy, including structured training programmes, peer mentoring networks, and protected time for curriculum redesign.

Holst et al. (2024), in a study on monitoring SDG 4.7 across education systems, argues for integrative monitoring of sustainability in education across input, process, output, and outcome levels — an approach that requires policy frameworks which make sustainability visible at each stage of the educational cycle, not only in final learning outcomes.

4. Resource allocation

Institutional alignment without corresponding resource allocation remains symbolic. Effective institutional alignment therefore requires that governance structures have authority over resource allocation, and that sustainability commitments translate into funded actions.

This includes:

- dedicated funding lines for faculty development in sustainability pedagogy;
- time allocations enabling educators to engage in curriculum redesign and interdisciplinary collaboration;
- investment in learning environments that support sustainability education, including living labs, digital platforms, and community engagement infrastructure;
- financial support for community and international partnerships.

Implementation Guidance

The process of institutional alignment is necessarily iterative and context-sensitive. Institutions should not wait for perfect conditions before beginning, but should identify entry points appropriate to their current governance maturity and resource context.

A useful starting point is a **Policy Alignment Audit**: a systematic review of existing institutional documents — strategic plans, curriculum policies, quality assurance frameworks, faculty development programmes — to identify where sustainability is already referenced and where integration gaps exist. This audit provides a baseline and a clear set of priorities for institutional dialogue.

Reflective questions for institutional leaders and curriculum committees:

- Is sustainability explicitly referenced in the institution's strategic plan as an educational priority, not only as an operational commitment?
- Does the institution have a dedicated governance body with responsibility for coordinating sustainability in curriculum and teaching?
- Are there formal mechanisms for recognising and rewarding faculty who contribute to sustainability curriculum development?
- Do curriculum approval and review processes include sustainability impact criteria?
- Is there dedicated funding supporting faculty development in sustainability pedagogy?

Tools

- **Policy alignment matrix**: a structured review tool mapping institutional policy documents against key dimensions of curriculum greening (learning outcomes, pedagogy, assessment, governance, partnerships, monitoring).
- **Governance integration checklist**: a practical checklist for assessing and developing institutional governance structures for sustainability in teaching and learning.
- **Sustainability KPI dashboard template**: a dashboard framework for tracking progress on institutional alignment indicators across governance, curriculum, faculty development, and partnerships.

Box 23
Campus-as-Lab for Health and Tech: KOSTÜ

Embedding Sustainability into Institutional Governance Kocaeli Health and Technology University (KOSTÜ) provides a powerful example of institutionalizing the Action Pillar by connecting human health with planetary health.

Actionable Practice: KOSTÜ transformed its facilities into a *Campus-as-Lab*. Nursing, dentistry, and technology students collaborate to monitor the campus's medical waste generation, energy efficiency, and digital carbon footprint. Short-term KPIs (e.g., reduction in single-use plastics in clinical labs) are directly tied to students' applied learning credits.

Real-World Example
Consider a dental clinic on campus. First, the dentist treats a patient. Next, the student nurse sorts the waste. They place needles in a red sharps box. Technology students use a digital scanner to weigh the box. This prevents spills and keeps the campus clean.

From diagnosis to institutional action

The results of the **GREEN LEAF Curriculum Greening Benchmarking Tool**, introduced earlier in this guidebook, can now be revisited from an institutional perspective. At this stage, the purpose is not to repeat the assessment, but to use the identified strengths and gaps to determine where institutional action is needed.

Pay particular attention to areas where curriculum ambitions are not yet supported by institutional arrangements. These may point to changes needed in programme review, quality assurance, leadership responsibilities, staff support, resource allocation or institutional strategy.

Select *two or three priorities* that can realistically be addressed within the next planning cycle. For each priority, identify the change required, the actors who can support or authorise it, the resources needed, and the evidence that would indicate progress. These priorities can then feed directly into the monitoring and evaluation process described in Step 10 - Figure 20.

Figure 20
From curriculum greening diagnosis to institutional action

01 Diagnose

Where are we now?

Use the GREEN LEAF Curriculum Greening Benchmarking Tool and LEAF Mapper. Identify strengths, gaps and opportunities.

02 Prioritise

What needs institutional attention?

Select two to three realistic priorities based on the diagnosis.

03 Embed

What needs to change?

Consider institutional strategy, governance, quality assurance, resource allocation and responsibilities.

04 Evidence

How will we know?

Define indicators and sources of evidence. Plan for review and continuous improvement. Feeds into Step 10.

SDS4HEI Toolbox – Sustainable Development Strategies for Higher Education Institutions

The **SDS4HEI Toolbox** supports higher education institutions in developing and implementing sustainability strategies from a whole-institution perspective. It brings together practical tools for assessing the institutional starting point, mapping existing practices, identifying gaps, engaging stakeholders and planning further action.

For institutional alignment, the toolbox is particularly useful because it connects sustainability with *governance, education, institutional strategy* and *decision-making*. Its resources include baseline and self-assessment tools, mapping exercises, governance and education checklists, stakeholder mapping and gap analysis. These can be used by institutional leaders, sustainability teams, programme leaders and educational developers to examine where sustainability is already embedded and where further institutional action is needed.

Within GREEN LEAF, the SDS4HEI Toolbox can complement the *Curriculum Greening Benchmarking Tool* by supporting the transition from diagnosis to institutional planning and implementation.



Visit the GreenUS Catalogue's page to download the toolbox

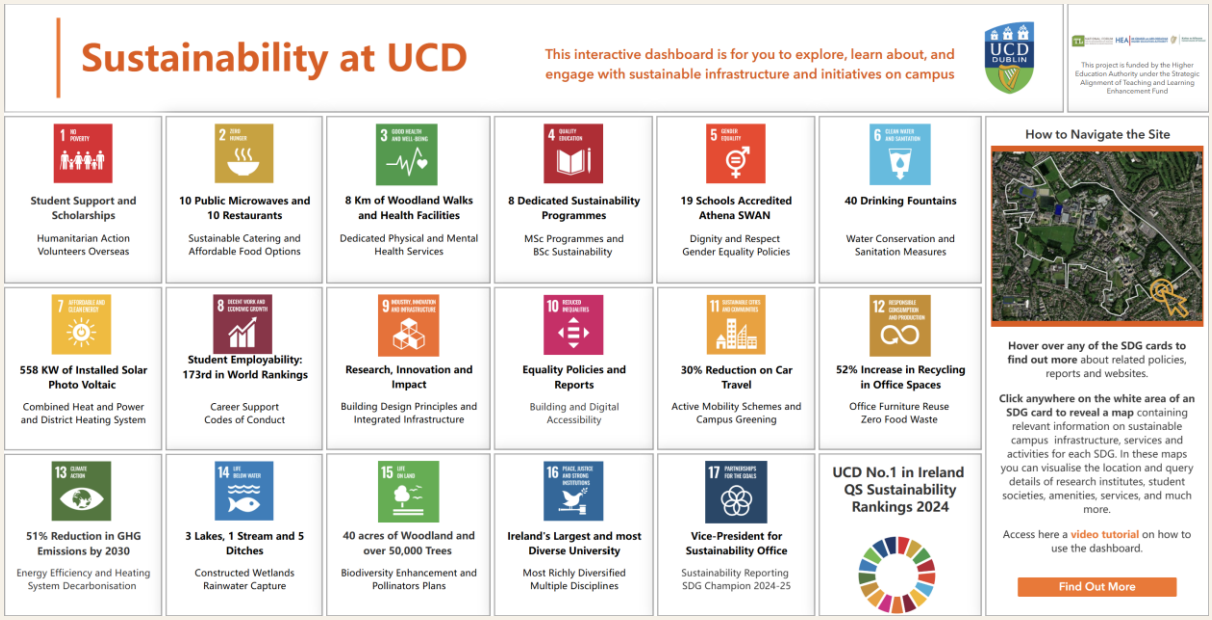
Practice example: Mapping sustainability for institutional action

At **University College Dublin (UCD)**, students and staff co-created an interactive dashboard that maps sustainability policies, initiatives, services and infrastructure across the campus against the Sustainable Development Goals. The process combined a review of existing institutional reports, campus-wide consultation, data collection and stakeholder review. The dashboard provides a baseline for monitoring sustainability while making gaps in data and institutional activity more visible.

The example shows how mapping can become more than a communication exercise. By bringing dispersed information together, an institution can identify areas requiring attention, support evidence-informed decisions and connect sustainability monitoring with teaching, engagement and campus operations. At UCD, the dashboard has also been used in teaching and to inform the prioritisation of institutional action.

Figure 21

Sustainability at UCD: an SDG-based dashboard mapping sustainability initiatives, infrastructure, services and institutional action across the university campus



Source: UCD Sustainability Dashboard

Explore in the GREENUS Catalogue: *Mapping Sustainability at University College Dublin: A Co-created SDG Dashboard*

10 Monitor and Evaluate Impact

The purpose of monitoring and evaluating impact is to move beyond symbolic change. It is not sufficient for institutions to declare their commitment to curriculum greening, to introduce sustainability modules, or to establish governance structures. What matters – for learners, for institutions, and for society – is whether these efforts produce meaningful educational outcomes, institutional transformation, and contribution to sustainable development.

Monitoring and evaluation provides the evidence base for continuous improvement. It enables institutions to understand what is working, identify persistent gaps, demonstrate accountability to stakeholders, and build the case for sustained investment in curriculum greening. Without robust evaluation, sustainability education risks becoming an institutional aspiration that is well-intentioned on paper but unable to demonstrate real-world impact.

THIS SECTION / ACTION PILLAR



A systematic mapping of sustainability assessment strategies in higher education, covering literature published between 2019 and 2024, identified a range of institutional strategies, factors and indicators for evaluating sustainable performance (Galeano Ospino et al., 2025). For curriculum greening, institution-level measures should be complemented by evidence of learning outcomes, pedagogical practice and educational impact.

Holst et al. (2024), analysing the monitoring of SDG 4.7 in Germany, argues that Education for Sustainable Development is currently implemented largely as an "add-on" to educational systems rather than as an integrated transformation, and calls for independent, integrative monitoring across input, process, output, and outcome levels to complement self-reporting and support evidence-informed policy development. González-Torre and Suárez-Serrano (2022) similarly propose an Input–Process–Output framework for evaluating what institutions can do, how they do it, and what results they achieve, noting that many universities have adopted sustainability agendas widely but in a scattered way, with shallow integration into courses and inconsistent evidence of impact.

Effective monitoring and evaluation of curriculum greening operates across three temporal horizons – short-term, medium-term, and long-term – and combines quantitative and qualitative indicators within coherent feedback loops.

1. Short-term indicators: course-level

Short-term indicators focus on changes at the level of individual courses and modules, typically trackable within one academic year. They address the immediate educational experience and are directly visible to learners and educators.

These include:

- *Curriculum coverage indicators*: the proportion of modules across a programme that explicitly address sustainability learning outcomes; the number of courses mapping to GreenComp competences; the presence of sustainability content in syllabi and assessment tasks.
- *Pedagogical indicators*: evidence of transformative, experiential, or community-connected learning approaches in sustainability-related courses; the use of living labs, service-learning, or challenge-based projects.
- *Student learning indicators*: student self-assessed sustainability competence (knowledge, values, agency) at the beginning and end of a course; student performance on sustainability-related assessment tasks; student satisfaction with the integration of sustainability in their studies.
- *Faculty indicators*: number of educators who have participated in sustainability pedagogy development programmes; proportion of programme teams who have engaged in interdisciplinary sustainability curriculum design.

These short-term indicators provide early signals of change and help educators and curriculum coordinators identify where immediate adjustments are needed.

2. Medium-term indicators: programme-level

Medium-term indicators track progress at the level of academic programmes, typically over a one-to-three-year horizon. They assess whether sustainability is becoming embedded in the learning culture and educational identity of a programme or faculty.

These include:

- *Programme-level integration*: evidence that sustainability learning outcomes are included in programme-level accreditation documents; proportion of learning outcomes at programme level that reference sustainability competences; inclusion of sustainability criteria in programme review processes.
- *Student engagement*: participation rates in sustainability-related extracurricular activities, student-led initiatives, and community engagement projects; student sustainability literacy as measured by validated instruments.
- *Stakeholder engagement*: number and quality of partnerships with external organisations connected to sustainability learning; evidence of co-designed learning activities involving community actors, NGOs, or public bodies.
- *Institutional governance*: existence and active functioning of sustainability governance structures; evidence of faculty development investment; integration of sustainability in HR and curriculum policy frameworks.

The AASHE Sustainability Tracking, Assessment & Rating System (STARS) provides a well-established international reference framework for medium-term institutional sustainability indicators. STARS organises performance indicators across four categories — Academics, Engagement, Operations, and Planning & Administration — and enables institutions to track progress over time and benchmark against peer institutions internationally (Association for the Advancement of Sustainability in Higher Education [AASHE], 2024). Its academic and engagement dimensions are particularly relevant for institutions pursuing curriculum greening, as they cover sustainability course offerings, learning outcomes, faculty development, and student engagement with sustainability.

3. Long-term indicators: institutional and community impact

Long-term indicators address the deeper transformational effects of curriculum greening, typically across three to ten years. They assess whether sustainability has become embedded in institutional culture, whether learners carry sustainability competences into their professional and civic lives, and whether the institution is contributing measurably to sustainable development beyond its campus.

These include:

- *Graduate tracking*: longitudinal studies tracking the sustainability-related career pathways, professional practices, and civic engagement of graduates; employer assessments of graduates' sustainability competences and preparedness.
- *Institutional culture change*: evidence of sustainability as a shared institutional value across faculties, disciplines, and governance levels; qualitative assessments of sustainability-related community of practice development among faculty.
- *Community and societal impact*: evidence that sustainability education has contributed to local or regional sustainability transitions through student projects, community partnerships, or policy engagement; co-produced research or innovation connected to sustainability challenges.
- *Systemic contribution*: institutional participation in national and international sustainability education networks; contributions to policy dialogues and sector-wide advancement of curriculum greening.

4. Feedback loops

Monitoring and evaluation is not a terminal activity but an ongoing cycle of learning and improvement. Effective impact assessment requires structured feedback loops that connect data back to decision-making processes at course, programme, and institutional levels.

This means:

- establishing annual greening review processes at programme level, where data on short-term indicators is reviewed by programme teams and used to identify priorities for the following academic year;
- conducting institutional sustainability audits every two to three years, combining quantitative indicator data with qualitative stakeholder feedback from students, educators, external partners, and governance actors;
- sharing findings publicly through institutional sustainability reports, contributing to transparency and accountability;
- using evaluation data to inform faculty development priorities, curriculum redesign decisions, governance adjustments, and strategic planning cycles.

Addressing common measurement challenges

Several persistent challenges in sustainability education evaluation should be anticipated and addressed by institutions.

Measuring learning outcomes beyond content recall. Traditional assessment methods are poorly suited to capturing sustainability competences such as systems thinking, ethical reasoning, collaborative agency, and action competence. Institutions should develop and validate competence-based assessment rubrics, reflective portfolios, and project-based evaluation methods that make these competences visible and assessable.

Attributing outcomes to curriculum interventions. Because students are simultaneously influenced by their wider social environment, community experiences, and media, it is methodologically challenging to attribute changes in sustainability attitudes or behaviours exclusively to curriculum interventions. Mixed-methods evaluation designs — combining pre/post surveys with qualitative interviews and observations — provide more robust evidence than single-method approaches.

Capturing long-term impact. Longitudinal tracking of graduates is resource-intensive and logistically complex. Institutions should establish tracking mechanisms early — ideally embedding consent and contact data collection into graduation processes — and consider collaborative approaches with professional associations or alumni networks to reduce the burden of individual institutional tracking.

Avoiding indicator overload. A common failure mode is the development of exhaustive indicator frameworks that are administratively burdensome and fail to generate actionable insights. Institutions should prioritise a small number of meaningful, regularly tracked indicators over comprehensive but underused frameworks.

Ensuring participatory evaluation. Students, educators, and community partners are not only subjects of evaluation but active contributors to the evaluation process. Participatory evaluation approaches — in which learners and stakeholders co-design evaluation questions, collect data, and interpret findings — generate richer insights and build shared ownership of the improvement process.

Reflective questions for programme teams and sustainability offices:

- Do we currently track the proportion of our programme's learning outcomes that address sustainability competences?
- How do we know whether our students are developing the sustainability competences we intend?
- Are we using assessment methods that make sustainability competences visible and measurable?
- Do we have processes for sharing evaluation findings with programme teams and using them to inform curriculum decisions?

- How do we track the sustainability-related experiences and engagement of our graduates?

Tools

- **Sustainability curriculum KPI framework**: a structured set of course-level, programme-level, and institutional-level key performance indicators for monitoring green curriculum integration, organised by temporal horizon and stakeholder group.
- **Annual greening review template**: a structured annual review process for programme teams, guiding data collection, interpretation, and priority-setting for the following academic year.
- **Impact reporting model**: a framework for institutional sustainability reporting that integrates curriculum greening indicators alongside operational sustainability data, enabling holistic impact communication to internal and external stakeholders.

Policymaker addendum

For Policymakers and Institutional Leaders

While faculty and educators are the primary drivers of the *Learning* and *Engagement* pillars within the GREEN LEAF framework, the *Action* pillar relies heavily on the structural architecture provided by policymakers and institutional leaders. Transformative curriculum greening cannot thrive in a vacuum; it requires an enabling environment where policies, resources, and institutional governance actively support systemic change rather than symbolic commitments. This addendum outlines the strategic mechanisms that policymakers, accreditation bodies, and university leadership must deploy to move higher education from fragmented environmental initiatives to holistic sustainability integration.

Regulatory Levers

Regulatory frameworks set the baseline for institutional priorities. To facilitate systemic curriculum greening, policies must shift from encouraging voluntary sustainability modules to mandating comprehensive competence integration.

- **Mandating Competence Frameworks:** Integrate internationally recognized standards, such as the European GreenComp framework, directly into national higher education qualifications. This ensures that cognitive, socio-emotional, and behavioral sustainability competences are treated as core graduate attributes across all disciplines.
- **Facilitating Transdisciplinary Structures:** Remove rigid bureaucratic barriers that isolate faculties. Implement regulatory guidelines that encourage cross-faculty course registration, allowing students to engage in the systems thinking required for complex climate and sustainability challenges.
- **Recognizing Non-Formal Education:** Create formal regulatory pathways that accredit non-formal learning and youth work. Recognizing the skills developed through civil society initiatives and community-based youth programs ensures a seamless bridge between academic theory and active civic engagement.

Box 24
Example from Turkiye

Top-Down Policy Synergy (YÖK): Systemic change requires regulatory alignment. The Council of Higher Education (YÖK) in Türkiye launched the "Sürdürülebilir ve İklim Dostu Kampüs Projesi" (Sustainable and Climate-Friendly Campus Project). By setting national expectations, YÖK has actively incentivized universities to build solar energy systems, utilize sensor-based smart lighting, and implement zero-waste strategies. Policymakers must use such national frameworks to transition universities from voluntary actions to mandated institutional KPIs aligned with national climate goals.

Incentive Systems

Educators often face structural disincentives when attempting to redesign curricula or adopt transformative pedagogies, as traditional academic metrics rarely reward these time-intensive efforts.

- **Redefining Academic Progression:** Revise tenure, promotion, and performance evaluation metrics to explicitly reward faculty contributions to sustainability education, community-engaged scholarship, and the development of experiential learning models.
- **Capacity Building and Micro-credentialing:** Support continuous professional development by officially recognizing and rewarding educators who complete specialized green teaching certifications or micro-credentials, empowering them to become Green Learning Ambassadors.
- **Fostering Distributed Leadership:** Institutionalize recognition for distributed leadership models, rewarding academic staff who build "communities of practice" that drive sustainability initiatives across different departments.

Example from Turkiye

Recognizing Non-Formal Education (Renaissance Institute):The Association of Renaissance Institute(ARI) demonstrates how NGOs can activate a network of “Green Learning Ambassadors” bridging non-formal youth work with formal academic structures. By focusing on Digital Transformation, Climate Action, and Active Quality Living, ARI partners with local universities (like Kocaeli University) to train youth workers.
Policy Recommendation:Policymakers and University Senates should create formal accreditation pathways (such as ECTS credits) that recognize the green skills and systems-thinking competencies students acquire through non-formal NGO training programs led by institutes like ARI.

Funding Mechanisms

Strategic financial support is the primary catalyst for transitioning from isolated pilot projects to whole-institution transformation. Funding must prioritize multi-stakeholder ecosystems and applied learning.

- **Civic and Municipal Partnerships:** Establish grant streams that specifically require higher education institutions to co-design projects with local governance bodies. For example, directing funds toward initiatives where universities collaborate directly with Metropolitan Municipalities and City Councils ensures that sustainability curricula are anchored in immediate, real-world civic challenges.

- **Seed Funding for Curriculum Redesign:** Allocate targeted institutional or state funds to support program directors and curriculum committees in the complex process of mapping existing courses, identifying gaps, and integrating sustainability metaconcepts.
- **Campus-as-Lab Investments:** Direct capital expenditure toward transforming campus infrastructure into living laboratories, providing students and faculty with the resources to test and scale greening practices locally.

Example from Turkiye

Scaling EU Seed Funding into Permanent Ecosystems (USEF-International Federation of Water Ambassadors): A common challenge in sustainability policy is ensuring that initiatives survive after grant funding ends. The International Water Ambassadors Federation (Uluslararası Su Elçileri Federasyonu - USEF) provides a stellar policy example. Originally born from a highly successful EU-funded project, the initiative used seed funding to institutionalize into a permanent Federation. Association of REnaissance Institute cofunded the federation to protect water with other organisations. Resource Link: https://usef.org.tr/ Policymakers can review the birth and mission of the USEF model here: [Uluslararası Su Elçileri Federasyonu (YouTube: https://youtu.be/hrvs-c30Hdc?si=pjUOzd9FHJ2fM7nM). Funding bodies must structure grants to require this kind of long-term civic institutionalization.

Accreditation Criteria

Accreditation and quality assurance bodies hold significant leverage in reshaping institutional behavior. Sustainability must be woven into the core fabric of institutional evaluation.

- **Action-Oriented Benchmarking:** Move quality assurance away from compliance-based audits. Integrate tools like the GREEN LEAF Curriculum Greening Benchmarking Tool into formal accreditation cycles to help institutions identify gaps and measure longitudinal progress across the Learning, Engagement, and Action pillars.
- **Evaluating Stakeholder Ecosystems:** Update accreditation standards to evaluate the depth and authenticity of a university's external partnerships. Institutions should be assessed on their active collaboration with NGOs, industry, and civil society to create participatory learning environments.
- **Assessing Holistic Outcomes:** Require institutions to provide evidence of authentic, competence-based assessments (such as reflective portfolios or project-based evaluations) rather than relying solely on traditional knowledge-recall metrics.

National Alignment Strategies

Curriculum greening achieves its highest impact when institutional efforts are synchronized with broader national and international sustainability trajectories.

- **Strategic Roadmapping:** Ensure that higher education policies are explicitly linked to national climate action plans, circular economy transitions, and the United Nations Sustainable Development Goals (SDGs).
- **Cross-Sectoral Integration:** Foster national networks that bridge the gap between formal higher education and active community development. Actively integrate civil society organizations specializing in youth participation and non-formal education into policy-making dialogues to ensure curricula remain responsive to the demands of the next generation.

GREEN LEAF policy ecology

For policymakers and institutional leaders / Action pillar

01	**Regulatory levers**	Mandate competence frameworks (e.g. GreenComp); remove transdisciplinary barriers; recognise non-formal learning and civic engagement.
02	**Incentive systems**	Redefine academic progression; build capacity and micro-credentials for Green Learning Ambassadors; foster distributed leadership and communities of practice.
03	**Funding mechanisms**	Support civic and municipal co-design partnerships; provide seed funding for redesign and gap analysis; invest in campus-as-lab approaches.
04	**Accreditation criteria**	Use action-oriented GREEN LEAF benchmarking; evaluate stakeholder ecosystems, including NGOs and industry; assess holistic competence outcomes.
05	**National alignment strategies**	Link strategic roadmaps to UN SDGs and the circular economy; integrate youth organisations and non-formal education; keep curricula responsive.

Reinforcing cycle: align mandates and goals, reward implementation, fund capability and benchmark progress.

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