D5.1: Handbook for the green transition of VET organisations

COMMONSPACE [Leader of WP5]

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Table of Contents

Introduction

Who is this guide for

This handbook is addressed to Vocational Education and Training (VET) organisations that aim to actively contribute to the green transition through inclusive, participatory and practice-oriented approaches.

The green transition may relate to vocational curricula, training practices, learning environments and physical infrastructures, as well as to institutional governance and organisational structures.

It can be addressed at **different scales**, ranging from specific training programmes, laboratories or campuses, to the level of the whole institution and its interaction with local and regional ecosystems. It is designed as a practical guide for a wide range of actors involved in the VET ecosystem, including:

- **VET learners,** both in initial and continuing vocational education and training, who are preparing to enter or adapt to a rapidly changing labour market shaped by sustainability and climate goals.
- **VET teachers**, trainers and tutors, who play a key role in integrating green skills, sustainability principles and participatory learning methods into curricula and training practices.
- **School leaders, managers and administrative staff**, responsible for strategic planning, institutional development and the operational transformation of VET organisations.
- **In-company trainers and employers**, who collaborate with VET providers through apprenticeships, work-based learning and skills development for green occupations.
- **Social partners, chambers, local authorities and civil society organisations**, contributing expertise, resources and local knowledge to the co-creation of sustainable training pathways.
- **Policy makers and education stakeholders**, interested in replicable methodologies that link VET, green skills development and community engagement.

The guide is particularly relevant for **VET organisations** that wish to move beyond isolated "green actions" and adopt a whole-institution and curriculum approach, where green transition is embedded in learning content, pedagogical practices, governance structures and relationships with the labour market and local communities.

Why the green transition in VET requires participatory approaches

The green transition is not only a technological or economic transformation; it is also a **social and educational process** that reshapes skills, professional identities, institutional cultures and relationships with the labour market. By focusing on participatory processes and co-creation ideas, this handbook supports VET organisations in developing, implementing and monitoring concrete green transition action plans, tailored to their local, sectoral and institutional contexts.

Due to its close connection to real work environments, VET is uniquely positioned to support the green transition by equipping learners with practical, job-relevant skills. However, **top-down reforms or isolated curriculum updates are often insufficient** to respond to complex and rapidly evolving green transition challenges. Effective green transition in VET requires the **active involvement of those who teach, learn, manage and apply skills in practice**.

Participation enables VET organisations to:

- identify real green transition challenges and emerging green skill needs linked to specific sectors and local labour markets,
- design training content and institutional actions that are realistic, applicable and aligned with workplace practices,
- strengthen ownership, motivation and long-term commitment among learners, educators and partners,
- foster social inclusion and ensure that green transition pathways are fair, accessible and context-sensitive.

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*Overall, participatory approaches allow VET organisations to address **environmental transition, social inclusion and educational quality in an integrated way**, creating the conditions for green transition strategies that are effective, inclusive and locally grounded. This perspective provides the conceptual foundation for the step-by-step methodology presented in the following chapters.*

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1. Green Transition Framework in VET

1.1 The climate challenge and the need for a green transition

The accelerating impacts of the climate crisis are reshaping economic systems, labour markets, and societal priorities across Europe and beyond. Climate-related pressures are no longer distant environmental concerns, but key factors influencing **how economies operate and how skills are defined, developed, and applied.** Addressing this evolving context requires not only technological and policy responses, but also fundamental changes in education, training, and workforce preparation.

> ***The green transition*** *has emerged as a central strategic framework, referring to the transformation of economic and social systems towards environmental sustainability, climate neutrality, and resource efficiency. It involves a shift away from carbon-intensive practices towards low-carbon, circular, and regenerative approaches across all sectors of the economy.*

At European level, the green transition is closely linked to the European Green Deal and the objective of climate neutrality by 2050, highlighting the critical role of green skills development in supporting sustainable growth and economic resilience. At the same time, **digital transformation** acts as a key enabler of the green transition. Digital technologies—such as data-driven systems, automation, and smart infrastructures—support energy efficiency, circular economy practices, and innovative business models, while simultaneously reshaping occupational profiles and skills requirements. As a result, the integration of green and digital skills has become increasingly important for a future-ready workforce.

Within this context, **Vocational Education and Training (VET) plays a particularly strategic role**, as it connects education directly with labour market needs and local economic ecosystems. Supporting the green and digital transitions requires the adaptation of VET curricula, teaching methods, and institutional capacities, enabling learners to acquire technical, transversal, and sustainability-oriented competences, as well as the ability to adapt to emerging professions.

This report builds on this understanding by approaching sustainability not as an abstract challenge, but as a concrete transformation process that requires targeted skills development, institutional adaptation, and coordinated action among education providers, employers, and policymakers.

1.2 Strengthening VET through green transition

VET systems face significant challenges in integrating climate change and sustainability into their programmes, including:

- **CURRICULUM GAPS**: Limited integration of climate change and sustainability topics & low climate literacy and insufficient skills for green jobs.
- **GREEN SKILLS DEFICIT:** VET providers struggle to offer updated and specialised training for emerging green sectors.
- **UNSUSTAINABLE INSTITUTIONAL PRACTICES:** High energy use and waste generation highlight the need for greener operations with learning value.
- **MISMATCH WITH LABOUR MARKET NEEDS:** Employer demand for sustainability competences evolves faster than VET provision.
- **NEED FOR STRONGER PARTNERSHIPS**: Closer cooperation between VET providers, industry and social partners is essential to keep training relevant.

Figure 1: Where can green transition be integrated

Despite these challenges, VET institutions are uniquely positioned to act as **key enablers of the green transition**. Through their strong emphasis on hands-on learning and close links with the labour market, VET programmes can effectively equip learners with the practical skills required for green and low-carbon economies. In addition to preparing young people for emerging green occupations, VET plays a crucial role in the **reskilling and upskilling of the existing workforce**, supporting just transition pathways for workers in sectors undergoing transformation. By integrating environmental literacy, resource efficiency and circular economy principles into vocational training, VET institutions embed sustainability across a wide range of professions. At the same time, their local and regional embeddedness allows them to contribute directly to **local economic development**, supporting the implementation of green technologies, creating quality jobs and enhancing social inclusion.

1.3 Benefits from Green Transitioning and Multi-stakeholder Engagement in VET Education

For Learners

- **Employability:** Access to new jobs in renewable energy and circular economies; better alignment with labor market demands.
- **Relevance:** Real-world problem-solving (e.g., emission management) increases engagement and motivation.
- **Agency:** Develops a "future-oriented" mindset, adaptability, and self-efficacy regarding climate challenges.
- **Transversal Skills:** Fosters critical thinking, collaboration, and interdisciplinary understanding.
- **Social Responsibility:** Instills lifelong ecological awareness beyond professional credentials.

For Educators and Training Providers

- **Attractiveness:** Modernizes curricula to appeal to eco-conscious learners.
- **Partnerships:** Encourages collaboration with industry and community organizations.
- **Professional Growth:** Drives innovation in teaching methods (e.g., experiential learning) and upskilling in green pedagogies.
- **Institutional Viability:** Enhances reputation and access to sustainability-oriented funding.

For Employers and Industry

- **Skilled Workforce:** Access to graduates with necessary technical and environmental competencies.
- **Competitiveness:** Supports innovation, resource efficiency, and compliance with new regulations.

- **Training Alignment:** Collaboration in curriculum design ensures training matches actual workplace needs.

For Society and the Environment

- **Green Transition:** Equips society with skills to mitigate and adapt to climate change.
- **Inclusion:** Provides employment pathways for marginalized groups.
- **Environmental Impact:** Cumulative improvements in energy efficiency and waste reduction across communities.

For Policy Makers and the VET System

- **Strategic Alignment:** Aligns skills development with national climate goals.
- **Efficiency:** Optimizes public/private investment by minimizing skill mismatches.
- **Local and Regional Development**: Stimulates local economies in green technologies and renewable sectors.

Cross-Cutting and Systemic Benefits

- **Innovation Catalyst:** Networks between education, industry, and community co-create solutions.
- **Flexibility:** Promotes micro-qualifications and lifelong learning for rapid adaptation.
- **Skills Intelligence:** Uses data to keep training aligned with evolving requirements.
- **Societal Transformation:** VET acts as a strategic investment for a resilient, equitable, and sustainable future.

2. Methodologies on how to bring the green transition into VET

2.1. A Holistic Approach in VET

The integration of sustainability into Vocational Education and Training (VET) requires a holistic approach that goes beyond traditional subject boundaries and isolated technical skills A holistic approach refers to:

- **Interdisciplinarity**, as sustainable development affects a wide range of vocational fields, including engineering, construction, energy, business, ICT, and services.
- **An integrated approach,** involving cooperation between education providers, industry, public authorities, and society to ensure coherence between training content and real labour market needs.

- **A TRANSFORMATIVE ORIENTATION,** requiring not only minor curricular adjustments but a systematic shift towards sustainability-oriented training and professional practice.
- **A PARTICIPATORY AND INCLUSIVE APPROACH**, embedding sustainability alongside transversal values such as equality, social responsibility, democratic participation, and environmental justice within training processes.

VET institutions play a key role in supporting the green transition by equipping learners with practical, job-relevant skills for sustainable technologies and processes. This requires interdisciplinary collaboration among trainers, institutional commitment to sustainability goals, and learning environments that combine theory with hands-on experience. One of the core principles of a holistic approach in VET is embedding sustainability across all vocational disciplines, rather than limiting it to environmental or energy-related courses.

Sustainability education in VET must also extend beyond the classroom through active engagement with external stakeholders, including companies, municipalities, sectoral organisations, and civil society. VET providers can function as regional hubs for sustainable innovation by creating partnerships that enable learners to work on real-life challenges. In this regard, the concept of **Real-World Laboratories** offers a valuable framework for sustainability-oriented vocational learning[1].

[1] Wanner, M., Hilger, A., Westerkowski, J., Rose, M., Stelzer, F., & Schäpke, N. (2018). Towards a Cyclical Concept of Real-World Laboratories: A Transdisciplinary Research Practice for Sustainability Transitions. *disP - The Planning Review*

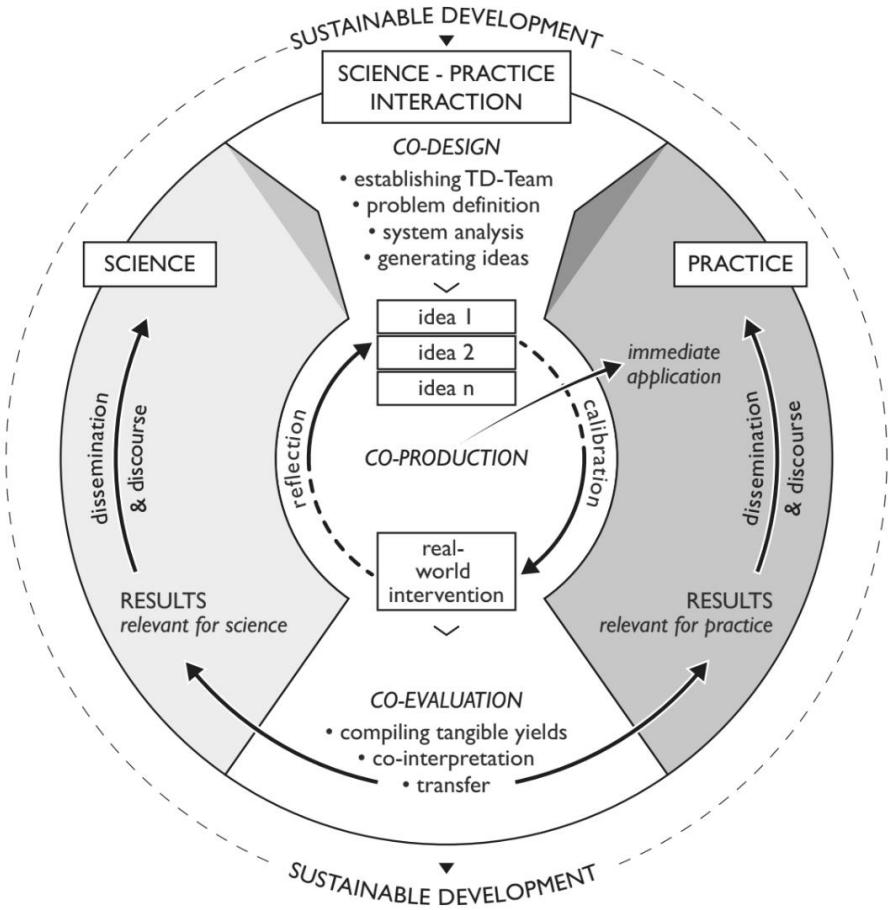


Figure 2: Real Word Laboratories, Source: Wanner et. al, 2018

A Real-World Laboratory consists of the following key elements:

1. **NORMATIVE ORIENTATION TOWARDS SUSTAINABLE DEVELOPMENT**
2. **PRODUCTION OF SYSTEM, TARGET, AND TRANSFORMATION KNOWLEDGE**
3. **USE OF REAL-WORLD PROBLEMS AS LEARNING STARTING POINTS**
4. **CLEARLY DEFINED THEMATIC AND SPATIAL BOUNDARIES**
5. **TRANSDISCIPLINARY COLLABORATION BETWEEN EDUCATION AND PRACTICE**
6. **REAL-WORLD INTERVENTION THROUGH EXPERIMENTATION**
7. **CYCLICAL LEARNING PROCESSES BASED ON REFLECTION AND ADAPTATION**
8. **EMPOWERMENT OF LEARNERS AS CHANGE AGENTS AND CAPACITY BUILDING**

A holistic approach to sustainability in VETequires active, learner-centred pedagogies that promote problem-solving, critical thinking, teamwork, and ethical awareness. By embedding sustainability across training programmes, strengthening institutional commitment, engaging employers and local stakeholders, and adopting transformative teaching methods, VET systems can play a crucial role in enabling the green transition.

2.2 Steps towards a green transition in VET curricula

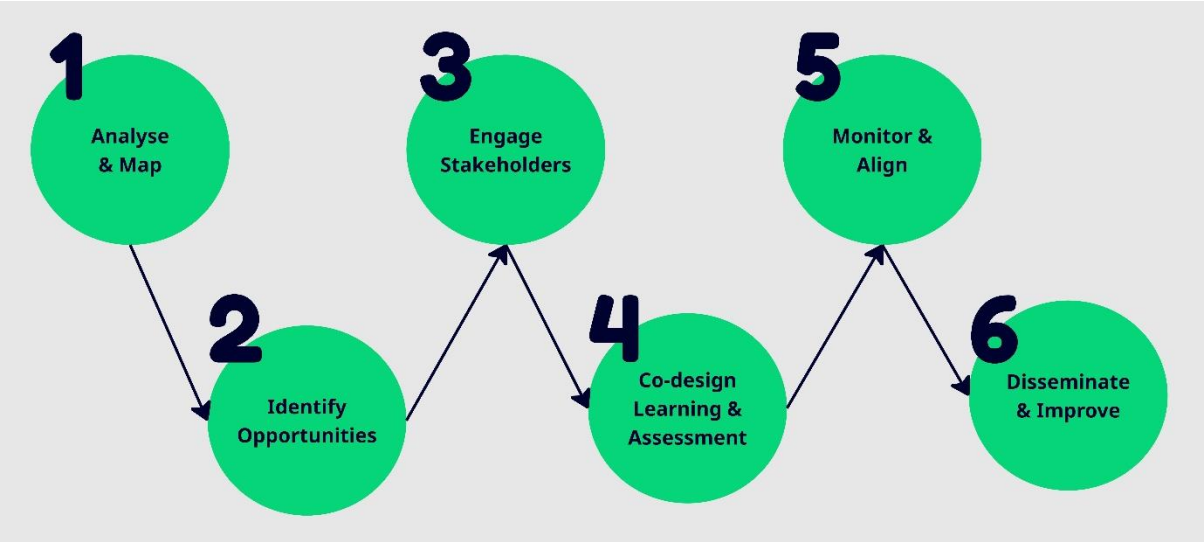


Figure 3. Methodological steps

Step 1: Analysing the existing VET curriculum and training provision

KEY GUIDING QUESTIONS

- Where are green transition–related topics already present in existing modules or training units?
- Which occupations, sectors or qualifications offered by the VET provider are most directly affected by the green transition?
- What green skills and transition-related competences are currently taught, and which are missing, outdated or insufficiently addressed?
- To what extent do training activities reflect green technologies, processes and practices used in real work environments?
- Are learners engaged in problem-solving activities that relate to real-life climate or green transition challenges within their vocational field?

ANALYSING GREEN TRANSITION INTEGRATION IN VET PROGRAMMES

- **Learning outcomes**: Do training objectives include competences related to the green transition?
- **Training content**: Are climate- and transition-related topics addressed in ways that are relevant to specific occupations and sectors?
- **Teaching and training methods**: Do learning activities promote practical problem-solving and work-based learning related to green practices?
- **Assessment practices**: Do assessments evaluate learners' ability to apply green transition principles in vocational contexts?

- **Practical application**: Are learners required to propose, test or implement solutions related to real workplace challenges linked to the green transition?
- **Review and improvement processes**: Is there a mechanism for updating training provision based on feedback from learners, trainers and labour market actors?

OUTCOMES

A clear picture of **how green transition aspects are currently integrated**, highlighting priority areas for improvement, and setting the basis for systematically embedding these principles into curricula and training practices. Through **stakeholder mapping**, identifying key actors, clarifying their roles and contributions to ensure an inclusive, relevant, and labour-market-grounded green transition process.

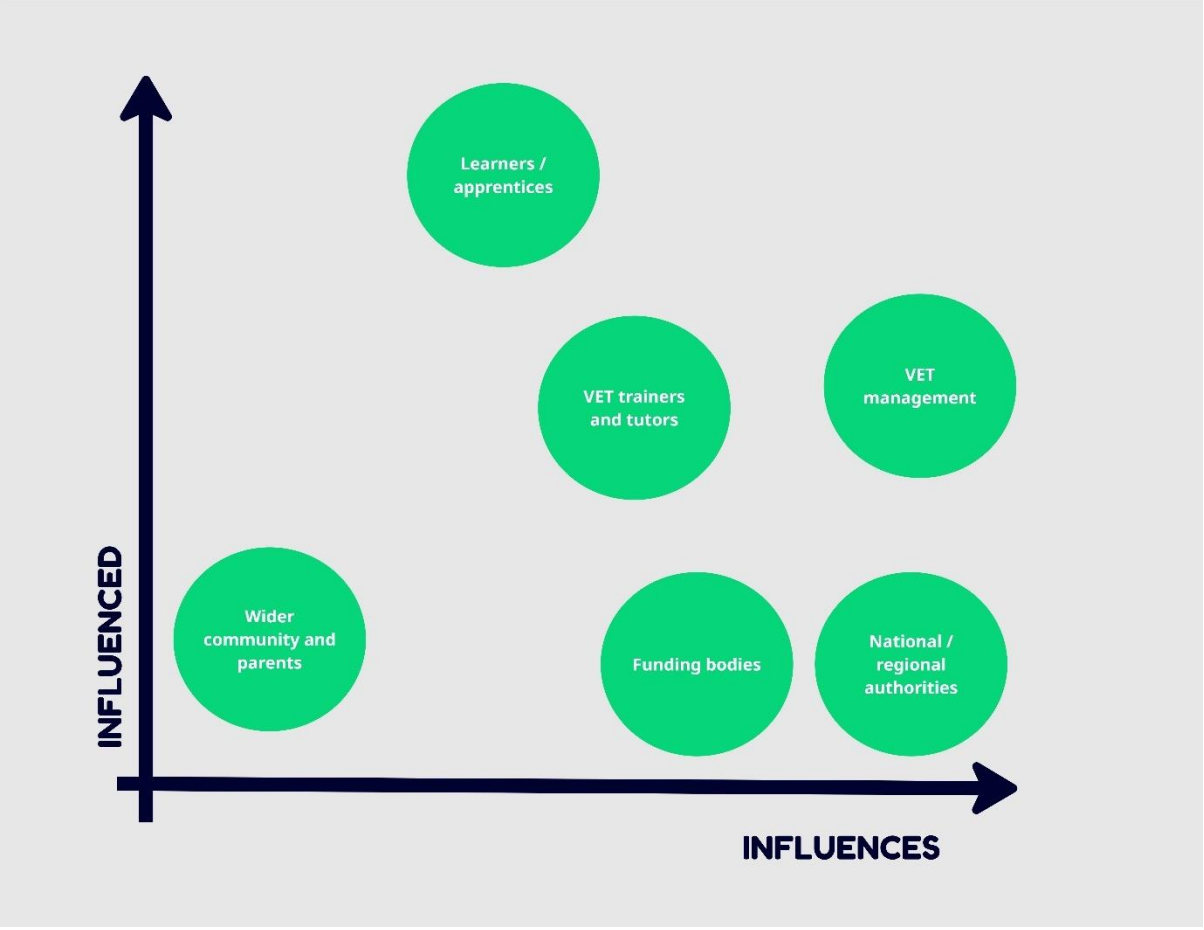


Figure 4. VET Stakeholder matrix example

Step 2: Identifying opportunities to integrate the green transition into VET curricula and training practices

KEY ENTRY POINTS FOR INTEGRATING THE GREEN TRANSITION IN VET

- **Training content and learning outcomes:** Existing modules can be updated to reflect environmentally responsible professional behaviour relevant to specific occupations and sectors.
- **Teaching and learning methods:** Project-based, problem-based and work-based learning approaches offer strong opportunities to address real green transition challenges drawn from workplaces, communities or local industries.
- **Workshops, laboratories and training facilities:** Practical training environments allowing learners to experience green practices directly through hands-on activities.
- **Apprenticeships and workplace learning:** Green transition practices in real work settings, especially when employers are actively engaged in curriculum adaptation.
- **Partnerships with employers and local actors:** Collaboration with companies, municipalities, and civil society actors can reveal emerging green skill needs and generate applied learning activities aligned with local transition priorities.

IDENTIFYING PRIORITIES AND FEASIBLE ADAPTATIONS

Prioritise areas where green transition integration is both relevant and feasible, considering factors such as:

- the level of impact of the green transition on specific occupations or sectors,
- the availability of expertise, equipment or partnerships,
- institutional capacity and readiness for change,
- alignment with national or European frameworks related to qualifications and green skills.

PARTICIPATORY PROCESSES

- Curriculum reflection workshops
- Consultations or focus groups with employers and in-company trainers
- Learner feedback activities
- Collaborative mapping exercises
- Digital and online tools

OUTCOMES

A **clear set of priority areas and entry points** for integrating the green transition into VET curricula and training provision. These priorities inform the next steps of the methodology, which focus on translating identified opportunities into concrete learning activities, teaching methods and assessment practices aligned with green transition objectives.

Step 3: Engaging stakeholders in curriculum adaptation for the green transition

PARTICIPATORY APPROACHES

- **Curriculum co-adaptation workshops**
- **Sectoral or occupational roundtables**
- **Validation sessions with employers and in-company trainers**
- **Learner-led contributions**
- **Face-to-face and digital tools**

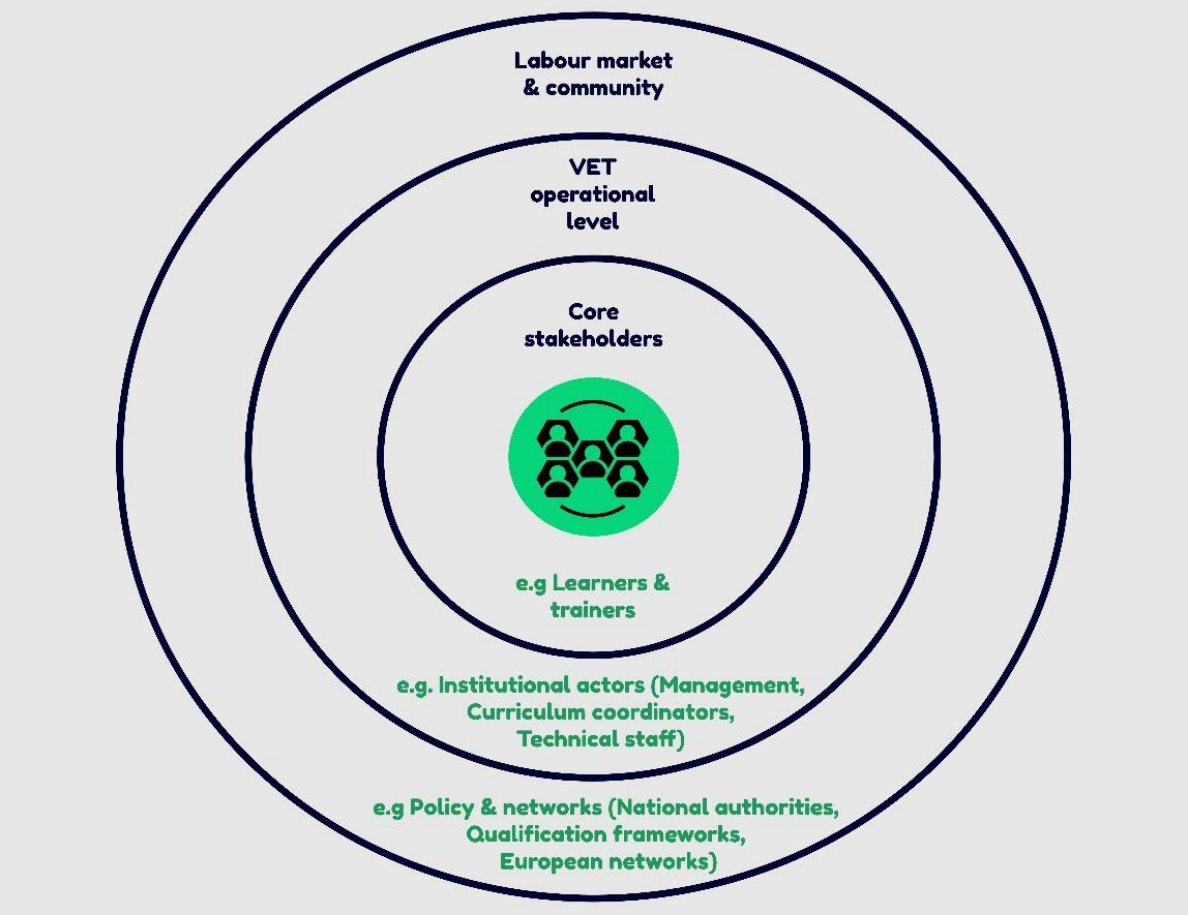


Figure 5. VET Stakeholder ecosystem

OUTCOMES

By actively involving stakeholders in curriculum adaptation, VET organisations strengthen **shared ownership and commitment** to the green transition. This increases acceptance of curriculum changes, supports smoother implementation and reinforces the relevance of training provision for learners and employers alike. Provides a solid basis for the next phase of the methodology, which focuses on the development of concrete learning activities, training practices and assessment approaches aligned with green transition objectives.

Figure 6. Collective mapping activity and participatory assessment exercise. Source: commonspace, Athens 15-minutes city

Step 4: Developing green learning activities and assessment methods

DEVELOPING PARTICIPATORY GREEN LEARNING ACTIVITIES

- **Project-based learning activities**, where learners work individually or in groups to address real green transition challenges identified in collaboration with employers, municipalities or community actors
- **Problem-solving tasks in workshops and laboratories**, focusing on the use of green technologies, sustainable materials or environmentally responsible processes, and allowing learners to test and compare alternative solutions.
- **Apprenticeship-based activities**, where learners observe, apply and reflect on green practices within real work environments, supported by in-company trainers and mentors.
- **Learner-led initiatives or challenges**, such as mini-hackathons, design challenges or innovation labs, where learners propose green solutions related to their sector or local context.

These activities foster **active participation, collaboration and responsibility**, helping learners connect vocational skills with green transition objectives.

SUPPORTING PARTICIPATION THROUGH LEARNING DESIGN AND TOOLS

Participation in learning activities can be enhanced through simple design choices and tools, such as:

- clear, open-ended tasks that allow multiple solutions,
- group work formats that encourage peer learning,
- reflection sessions where learners discuss challenges, trade-offs and impacts of proposed solutions,

- digital collaboration tools (e.g. shared documents, online whiteboards) to support teamwork and idea development in blended or online settings.

PARTICIPATORY ASSESSMENT METHODS FOR GREEN TRANSITION LEARNING

- **Project-based assessment**, evaluating learners' ability to design, implement or propose green solutions relevant to their vocational field.
- **Portfolio assessment**, where learners document their learning process, practical tasks and reflections on green transition practices.
- **Peer and self-assessment**, encouraging learners to reflect on their contributions and learning outcomes.
- **Feedback from employers or in-company trainers**, providing real-world perspectives on the relevance and quality of learners' work.

OUTCOMES

By integrating participatory learning activities and assessment methods into regular training provision, VET organisations ensure that the green transition becomes a **core element of everyday vocational learning**.

Step 5: Aligning curricula with qualification frameworks and continuous improvement

ALIGNING GREEN TRANSITION LEARNING OUTCOMES WITH QUALIFICATION FRAMEWORKS

Once green transition learning activities and assessment methods have been developed, VET providers may review how updated learning outcomes relate to existing qualification frameworks and reference tools. National qualification frameworks and the European Qualifications Framework (EQF) support transparency, recognition and coherence of vocational qualifications, while the GreenComp framework can be used as a reference point for identifying and structuring green transition–related competences in VET contexts.

EMBEDDING GREEN TRANSITION WITHIN INSTITUTIONAL STRATEGIES

Curriculum adaptation for the green transition is most effective when it is connected to **broader institutional priorities and strategies**. VET providers may reflect on how updated curricula contribute to institutional objectives, support organisational commitments to climate action or environmental responsibility and align with partnerships with employers, local authorities or sectoral organisations.

MONITORING AND FEEDBACK FOR CONTINUOUS IMPROVEMENT

The integration of green transition aspects in Vocational Education and Training (VET) should be understood as an **ongoing and iterative process**, rather than a one-off curriculum reform. Continuous improvement is essential to ensure that training provision remains relevant in the

face of technological developments, evolving labour market needs and changing workplace practices. To support this process, VET organisations can establish **simple and proportionate monitoring mechanisms**, such as:

- periodic reviews of learning outcomes, training content and assessment practices,
- systematic collection of feedback from learners, trainers, in-company trainers and employers,
- regular reflection on the relevance of training provision in relation to green transition developments within specific sectors or occupations.

DOCUMENTING CHANGES AND SUPPORTING LEARNING OVER TIME

- brief descriptions of curriculum changes and their objectives,
- documentation of new learning activities or assessment approaches,
- summaries of lessons learned and good practices.

OUTCOMES

By aligning curricula with qualification frameworks and embedding monitoring and feedback mechanisms, VET organisations strengthen the **quality, relevance and durability** of green transition integration. This step ensures that green skills and practices remain up to date, recognised and embedded in everyday vocational training, supporting learners, employers and communities in navigating ongoing transitions.

Step 6: Dissemination and continuous improvement of green transition practices in VET

Dissemination is not understood as a one-way communication activity, but as a participatory process that supports learning, dialogue and replication across institutions and sectors.

Dissemination activities may include:

- sharing results and achievements through institutional websites, social media and professional networks,
- publishing short reports, case studies or practice briefs documenting curriculum adaptations and learning activities,
- organising workshops, open days or peer-learning events where trainers, learners and partners present their experiences,
- participating in conferences, thematic events or networks related to VET, skills development and the green transition.

By involving learners, trainers and external stakeholders in dissemination activities, VET organisations reinforce **visibility, ownership and collective learning**, while encouraging other institutions to adapt and replicate successful practices.

SUPPORTING CONTINUOUS IMPROVEMENT THROUGH PROFESSIONAL DEVELOPMENT AND NETWORKING

To sustain progress over time, VET providers can link dissemination activities with **continuous professional development** for trainers and tutors. Networks involving VET providers, employers, social partners, public authorities and civil society organisations enable continuous exchange of knowledge, resources and experiences related to the green transition. Through these networks, VET organisations can:

- share challenges and solutions,
- jointly reflect on emerging trends and skill needs,
- refine and adapt green transition strategies over time.

OUTCOMES

Dissemination and continuous improvement complete a cyclical process of reflection, learning and adaptation. By embedding dissemination, professional learning and networking into their green transition efforts, VET organisations ensure that green transition practices remain dynamic, relevant and embedded in everyday education and training, supporting learners, educators and communities navigating ongoing transitions.

3. Ideas on how to bring the green transition into VETs

The following chapter includes indicative ideas and examples. They illustrate how VET organisations can translate the proposed participatory methodology into **concrete actions and initiatives**, adapted to their institutional context, vocational fields and local green transition priorities. The examples focus on practical, participatory and work-based approaches that strengthen green skills development and institutional transformation.

Activities and Campaigns for Green VET

VET institutions are increasingly integrating sustainability into their daily operations, training activities, and community engagement through a wide range of green initiatives. A key entry point is **the greening of institutional operations**, including the adoption of energy-efficient lighting and appliances, water conservation measures, waste reduction and recycling systems, and sustainable procurement practices. Many institutions also enhance their outdoor spaces through tree planting, vegetable and rain gardens, and the sustainable use of schoolyard resources. These interventions reduce environmental impact while functioning as living laboratories that demonstrate sustainability in practice.

Hands-on workshops and practical training modules form a core component of Green VET strategies. Learners engage in activities related to renewable energy systems, such as solar panel installation and photovoltaic maintenance, as well as sustainable agriculture practices including organic farming and water-efficient irrigation. In parallel, VET institutions **organize awareness-raising campaigns** that promote environmental responsibility among students and staff. These include thematic events such as "Green Talks," sustainability webinars, environmental days, eco-clubs, and participatory workshops focusing on spatial and environmental planning. Learner-led initiatives often address local sustainability challenges, fostering peer learning, civic engagement, and community outreach.

To ensure continuity and accountability, many institutions establish eco-action teams composed of learners, teachers, and administrative staff. These teams conduct environmental audits assessing energy use, water consumption, waste management, and mobility patterns, and subsequently develop a Green VET Action Plan with concrete and measurable targets. This participatory process strengthens institutional capacity for environmental management while offering students hands-on experience in sustainability assessment and reporting.

Innovation is further encouraged through **competitions, challenges, and hackathons** focused on green solutions. Learners are invited to design and pilot ideas addressing real-world issues, such as reducing waste in workshops, reusing industrial by-products, or developing energy-saving technologies. Involving local companies as mentors or partners enhances relevance and creates opportunities for networking, applied learning, and entrepreneurial development.

Digital communication tools amplify the impact of these initiatives. Institutional websites, newsletters, and social media campaigns are used to disseminate sustainability messages, share good practices, and highlight student achievements. This ongoing communication supports behavioral change, increases visibility, and connects VET institutions to national and European sustainability networks. Collaboration with external stakeholders is essential to the greening of VET. Open days and **"Green Skills in Practice"** events organized with municipalities, NGOs, and businesses allow students to engage directly with green technologies and practices.

Green Learning Activities and Programmes

One core strategy is **curriculum integration**, whereby environmental and climate-related topics are embedded into both general education and technical subjects. **Project-based learning** plays a central role in this process. Students engage in applied projects such as designing rain gardens, developing energy-efficient devices, creating sustainable urban furniture, or implementing small-scale renewable energy solutions. These activities foster problem-solving, creativity, teamwork, and interdisciplinary collaboration, while often incorporating entrepreneurial elements that link sustainability to innovation and local development.

Institutions are also encouraged to develop new, dedicated **green VET programmes** addressing emerging labor market needs. Training for solar panel installation, energy-efficient building retrofitting, wind turbine maintenance, waste management, and circular economy

practices responds directly to regional decarbonization strategies and the growing demand for specialized green technicians.

Work-based learning remains a cornerstone of VET and offers significant potential for greening the system. Apprenticeships and placements in green enterprises provide learners with exposure to sustainable technologies, organizational cultures, and real-world environmental challenges, while supporting employers in developing a skilled green workforce.

Green Initiatives and Living Laboratories in VET

Many VET institutions are transforming their campuses into **living laboratories for sustainability**. Renewable energy installations, such as solar photovoltaic systems, energy-efficient lighting, and smart monitoring technologies, serve both operational and educational purposes. Students participate in monitoring energy performance, optimizing systems, and assessing environmental impacts as part of their training.

A whole-institution approach is essential for long-term impact. By integrating sustainability into strategic planning, governance, and evaluation processes, VET institutions ensure coherence and continuity. Regular self-assessment, peer review, and the publication of Green Action Plans support transparency, accountability, and continuous improvement, positioning VET institutions as role models in the transition toward a low-carbon and sustainable society.

4. Applied examples from the field

4.1. Embedding Sustainability and SDG Learning Outcomes Across All Programs

Institution: Frederick University

Description of the Case

The initiative *"Embedding Sustainability and SDG Learning Outcomes Across All Programs"* represents a fundamental, institution-wide curriculum reform at Frederick University. The core objective was to institutionalise the University's commitment to Education for Sustainable Development (ESD) by ensuring that sustainability principles, knowledge, values and skills are systematically integrated into every course. In this way, all graduates are equipped with the competencies needed to act as agents of change and to address complex global and local challenges.
The initiative was implemented as a multi-year effort aligned with the University's 2022–2030 Strategic Plan. A three-year preparatory phase (2022–2024) focused on faculty capacity building through targeted training, guidance and resource development. The main output—comprehensive restructuring of all course outlines and the formal integration of new requirements—was completed in 2025.

Scope and Problem to Be Tackled

Frederick University's Strategic Plan articulated a strong institutional commitment to ESD. The central challenge was to translate this commitment from a guiding principle into a non-negotiable, systemic and practical component of every student's learning journey. Prior to the reform, sustainability content was often concentrated in specific departments or courses. The initiative aimed to break down these silos and establish a universal foundation of sustainability literacy and competence across all disciplines.

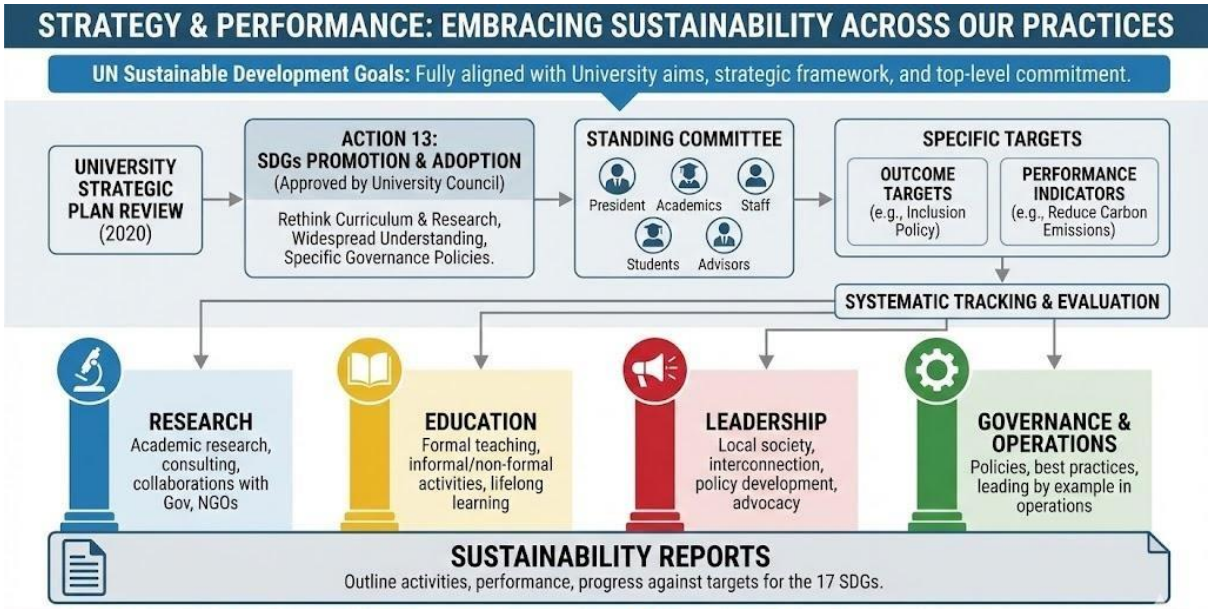
The educational challenge was linked to the growing mismatch between the complexity of global challenges and traditional curriculum structures. Graduates across all fields—from engineering to humanities—need holistic understanding and transferable sustainability competencies such as systems thinking, critical thinking, responsibility and future orientation. This need was reinforced by the local environmental context in Cyprus, where intensifying ecological challenges and national priorities on climate action underscored the urgency of preparing graduates to contribute effectively to the green transition.

The project was institution-wide, affecting all programs, faculty and students. It addressed:

- **Student needs**, by ensuring balanced development of knowledge, values and practical skills (Head, Heart and Hands).
- **Industry and community needs,** by preparing graduates capable of innovating and leading sustainable practices aligned with national and local green transition goals.

The initiative was fully aligned with the University's mission to advance knowledge for the betterment of society and has positioned Frederick University as a national leader in advancing the UN Sustainable Development Goals.

Steps Followed (Methodology)



Planning and Preparation Phase (2021–2024)

The planning phase focused on commitment, needs analysis and capacity building:

1. **Strategic Commitment and Mandate:** The initiative was launched under the non-negotiable mandate of the University's 2022–2030 Strategic Plan, securing institutional buy-in and resource allocation.

2. **Needs Analysis and Baseline Mapping:** A comprehensive mapping exercise assessed faculty familiarity with the SDGs, confidence in integration and the existing presence of SDG-related content across courses.
3. **Framework Selection:** The University adopted the Competence-Based Education for Sustainable Development (CB-ESD) approach, underpinned by the 3H (Head, Heart, Hands) educational philosophy.
4. **Resource Preparation:** A three-year programme of guidance, workshops and practical resources was developed to support faculty in preparing for the curriculum reform.

Implementation Phase (Completed in 2025)

Implementation focused on systemic curriculum restructuring and pedagogical change:

1. **Systemic Curriculum Restructuring:** All course outlines were comprehensively restructured through the mandatory adoption of a new course outline template.
2. **Mandatory Integration:** Every course was required to include:
    - explicitly defined Learning Outcomes linked to one or more SDGs,
    - embedding of Horizontal/Sustainability Competences such as critical thinking, systems thinking, responsibility and future orientation.
3. **Pedagogical Shift:** Faculty were supported in applying experiential, project-based and problem-based learning approaches.
4. **Professional Practice Integration:** Work Placement was formalised as a mandatory or elective component in 100% of undergraduate programmes, ensuring alignment between academic learning and professional sustainability principles.

Management and Monitoring

The initiative followed a dual approach combining top-down governance and bottom-up faculty engagement. Monitoring is ensured through the mandatory course outline template, which acts as a formal quality assurance tool. Approval of each course outline requires verification of SDG-linked learning outcomes and embedded horizontal competences, making sustainability integration auditable and continuous across all disciplines.

Strengths and Weaknesses

Strengths

- A clear, non-negotiable strategic mandate ensured full institutional buy-in.
- Mandatory, systemic integration across all programmes broke down disciplinary silos.
- A proactive three-year capacity-building phase addressed gaps in expertise.
- Use of holistic and practical frameworks (CB-ESD and 3H).
- Formal integration of Work Placement strengthened links between theory and practice.

Weaknesses / Challenges

- The scale and complexity of institution-wide curriculum reform required sustained coordination.
- Initial resistance related to breaking disciplinary silos and integrating transversal competences.
- External policy constraints limited the expansion of micro-credentials due to the absence of a national framework.

Lessons Learnt

A key lesson is the importance of anchoring such initiatives in a clear, high-level strategic mandate. Systemic and mandatory integration, formalised through a standard course outline template, ensures lasting and auditable change. Capacity building is essential for supporting educators through pedagogical and cultural shifts.

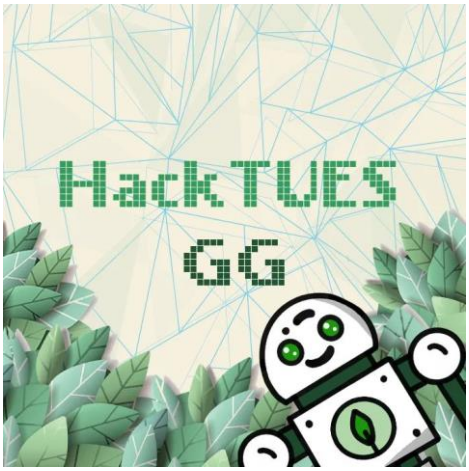
If implemented again, greater early attention would be paid to addressing external policy constraints, particularly regarding micro-credentials. Overall, the initiative successfully transformed sustainability from a guiding principle into the core educational foundation of the institution, ensuring long-term quality assurance and continuous improvement.

4.2. Student Hackathon “Develop for the Environment” and Its Impact on Green Practices in a VET School

Institution: Technological School "Electronic Systems" (TUES)

Description of the Case

In 2023, our school organised a student hackathon under the theme **“Develop for the Environment”**, aiming to encourage young people to create practical solutions that support sustainability within their communities. The event brought together more than 250 students, 40 mentors from industry and academia, and several partner organisations working in the field of environmental protection. The hackathon followed the standard structure of a 48-hour development event, during which teams designed, prototyped, and presented functional solutions addressing real environmental challenges.



The projects developed ranged from smart waste-sorting systems and energy-use visualisation tools to applications encouraging responsible water consumption. Several teams also proposed awareness-raising initiatives and school-based programmes for reducing waste and promoting sustainable habits.

What makes this case relevant for VET is not only the educational value of the event, but also the fact that **a number of student ideas were later implemented inside the school**. These included:

- introducing a student-led digital system for tracking energy and water usage in school buildings;
- establishing a permanent "Green Students Group" that coordinates waste-reduction activities, charity collections, and awareness campaigns;
- applying parts of the waste-sorting prototype in the school's new waste-management system;
- organising joint activities with local environmental NGOs based on partnerships created during the hackathon.

The hackathon served as a demonstration of how hands-on, problem-based learning events can support the broader green transition of a VET institution. It helped build skills, create sustainable initiatives, and strengthen cooperation with external stakeholders.

Scope and Problem to Be Tackled

The main problem addressed by the hackathon was the lack of structured, student-driven initiatives promoting sustainability in the school environment.

The school also faced three concrete challenges:

1. **High levels of mixed waste** and limited student engagement in recycling.
2. **Low awareness of real energy consumption**, making it difficult for students and staff to understand the impact of their daily actions.
3. **Limited opportunities for students to connect their technical skills to meaningful real-world environmental problems.**

The hackathon aimed to address these issues by bringing students, teachers, and external experts together in a structured environment where they could work intensively, apply their technical knowledge, and propose practical solutions that the school could realistically implement.

The scope of the event extended beyond the 48 hours. The goal was not simply to produce prototypes, but to embed sustainability in the school culture. Therefore, the hackathon served as a starting point for long-term initiatives: new partnerships, green student groups, and the introduction of digital tools supporting sustainable behaviour.

Through the theme "Develop for the Environment," the event connected education, technology, and environmental responsibility, focusing on solutions with clear application in both school operations and the local community.

Steps Followed (Methodology)

The organisation of the hackathon followed a structured methodology that ensured both educational impact and practical outcomes.

1. **Preparation Phase**
    - A steering group of teachers, students, and external partners defined the environmental challenges based on school data (waste management, energy consumption, and water use).
    - The school collaborated with local NGOs, municipal representatives, and companies working in green technologies to refine the problem statements.
    - Mentors with relevant expertise were invited to support the teams during the event.
2. **Awareness and Engagement**
    - Short preparatory workshops were delivered to all interested students on topics such as sustainable behaviour, circular economy, environmental data, and prototype development.
    - A school-wide campaign encouraged participation and promoted the purpose of the event.
3. **Hackathon Execution (48 hours)**
    - Students formed teams and selected a specific environmental challenge.
    - Mentors guided teams through problem analysis, concept creation, prototype development, and user testing.
    - The event included mini-sessions on design thinking, project management, and presentation skills.
    - Teams presented their solutions to a jury of teachers, environmental experts, and industry partners.
4. **Post-Event Implementation**
    - The school selected several projects with potential for real application.
    - Students participated in refining prototypes and adapting them to the school context.
    - Teachers and administrators supported the integration of solutions such as waste-sorting improvements and digital tracking tools.
5. **Long-Term Follow-Up**
    - A student “Green Group” was created to continue activities and monitor implementation.
    - The school maintained close cooperation with the partners involved in the hackathon.
    - Results and experiences were shared with other VET institutions.

Strengths and Weaknesses

Strengths

- **High student motivation:** The competitive, collaborative, and time-limited format increased engagement.
- **Practical relevance:** Projects were based on real school data and real environmental issues.
- **Strong partnerships:** Collaboration with NGOs and industry expanded the expertise available to students.

- **Long-term impact:** Some solutions were implemented after the event, demonstrating the practical value of student work.
- **Skill development:** Students strengthened both technical and soft skills—teamwork, communication, and time management.

Weaknesses

- **Resource intensity:** Organising a large event required significant time, staff coordination, and logistical support.
- **Limited implementation capacity:** Not all projects could be fully developed beyond prototypes due to budget and technical constraints.
- **Uneven mentor availability:** Some teams received more support than others, depending on mentor schedules.
- **Sustainability challenges:** Maintaining enthusiasm after the event required continuous guidance and structured follow-up activities.

Lessons Learnt

The hackathon demonstrated that structured, high-energy events can successfully support the green transition of a VET institution when they are connected to real-life challenges and followed by genuine implementation. The most important lessons include:

1. **Student ownership drives change.**When students are the creators of solutions, they are much more committed to long-term sustainable behaviour.
2. **Partnerships are essential.** External experts improved the technical quality of projects, increased credibility, and helped connect the school with broader green initiatives in the community.
3. **Preparation matters as much as the event itself.** Workshops and early engagement ensured that students started the hackathon with a strong understanding of environmental problems.
4. **Post-event structures are crucial.** Without a follow-up plan, even excellent projects risk being forgotten. Creating the “Green Students Group” was key to maintaining momentum.
5. **Small implementations have big symbolic impact.** Even partial integration of prototypes (such as energy-tracking dashboards or waste-sorting improvements) showed students that their work has real value.

Overall, the hackathon proved to be an effective model for combining VET education, environmental responsibility, and community engagement. It positioned the school as an active contributor to the green transition and demonstrated how student creativity can lead to sustainable practices with long-term benefits.

4.3. Project “Green You - Enhancing youth employability during the green transition”

Institution: Klaipėdos valstybinė kolegija (KVK):

Description of the Case

Green You – Enhancing Youth Employability during the Green Transition is an Erasmus+ Strategic Partnership project (KA220-YOU) coordinated by Klaipėdos valstybinė kolegija (KVK), implemented in cooperation with partner organisations from Ireland, Cyprus, France, Greece and Poland. The project ran from June 2023 to May 2025 with a total budget of approximately €250,000.

The project was designed to address a key contemporary challenge: equipping young people and youth workers with the skills, competences and mindsets required for the green and digital transitions. Its primary objective was to strengthen youth employability by integrating green skills and digital competences into accessible, engaging and practice-oriented learning experiences.

To achieve this, GreenYOU developed innovative digital learning tools, including a Massive Open Online Course (MOOC), augmented reality (AR)–based learning modules and gamified escape-room-style activities. These tools aimed to transform sustainability from an abstract concept into a concrete competence area directly linked to labour-market readiness. Within KVK, the project was coordinated by the International Relations and Projects Department, with the involvement of academic staff from the Faculties of Technologies and Social Sciences, as well as students who participated in pilot testing.

The project timeline included an initial needs analysis and curriculum mapping phase (mid-2023), digital content design and prototype testing (late 2023–early 2024), pilot implementations with youth groups (mid-2024) and a final international conference hosted by KVK in May 2025.

Key outputs included:

- a MOOC on climate change and green transition awareness,
- AR-based digital escape rooms focusing on sustainability problem-solving and teamwork,
- digital toolkits for youth workers and educators,
- workshops, webinars and dissemination events across partner countries.

Together, these outputs formed an integrated educational ecosystem combining sustainability knowledge, employability skills and digital literacy.

Scope and Problem to Be Tackled

The GreenYOU project responded to two interrelated challenges: the accelerating green transition of the economy and persistent youth unemployment across Europe. While demand for green skills is rapidly increasing, many young people lack environmental knowledge, digital fluency and vocational readiness to access emerging green jobs. This skills gap risks deepening social and economic inequalities, particularly for youth with fewer opportunities.

The educational challenge lay in the limited capacity of youth workers and educators to integrate sustainability and advanced digital tools—such as augmented reality—into non-formal and vocational education. Many organisations lacked interactive, learner-centred resources capable of engaging young people and developing transversal competences such as critical thinking, creativity and collaboration.

GreenYOU operated as a transnational initiative involving seven partners across six EU countries and multiple sectors, including higher education, research, SMEs and NGOs. It supported European Green Deal priorities and the EU Youth Strategy (2019–2027) by aligning environmental education with digital transformation and employability development. At national and regional levels, the project contributed to strengthening green competences, sustainability education and digital literacy.

Steps Followed (Methodology)

1. Planning and team set-up
A seven-partner consortium was established, with clearly defined roles and governance structures. KVK coordinated the project, while responsibilities for quality assurance, content development, technical infrastructure, AR design, dissemination and curriculum development were distributed among partners. A Project Steering Committee ensured accountability and coordination.

2. Needs analysis and scoping
Desk research, focus groups and online surveys with youth workers and young people identified gaps in green competences, digital readiness and employability skills. Findings directly informed the design of the MOOC, curriculum framework and digital escape rooms.

3. Work planning and governance
A detailed work plan and Gantt chart guided implementation across five work packages. Digital collaboration tools supported coordination, while biannual reports, a quality assurance plan and risk management procedures ensured timely monitoring and adjustment.

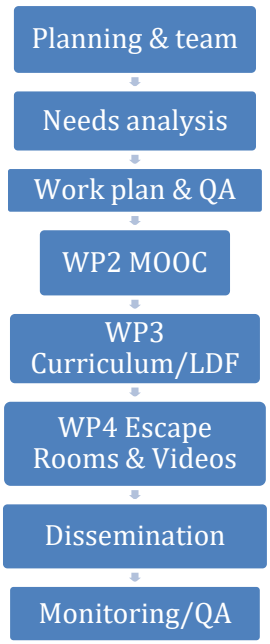
4. Implementation – MOOC and e-learning
Partners co-created five learning modules and open educational resources, which were tested, validated, revised and translated. The platform complied with GDPR and accessibility standards.

5. Implementation – Curriculum and learning design framework
A curriculum framework based on Design Thinking was developed, piloted with youth workers and aligned with DigCompEdu and GreenComp, ensuring pedagogical coherence and relevance.

6. Implementation – AR escape rooms and animations
Six AR-based escape rooms and six short animations were co-developed, localised and refined through pilot testing and user feedback.

7. Dissemination and engagement
National workshops, online campaigns and a final international conference supported visibility and uptake. All outputs were released as open-access resources.

8. Monitoring and evaluation
Monitoring combined pilot feedback surveys, analytics data and evaluation reports, assessing usability, engagement and digital competence development.



Strengths and Weaknesses

Strengths

- Effective translation of complex sustainability concepts into engaging, practice-oriented learning experiences.
- Strong integration of digital innovation, employability and green skills.
- Modular, open-access and adaptable learning resources.
- Co-creation involving youth workers, learners and digital designers.
- Iterative design supported by continuous feedback and pilot testing.
- Strengthened institutional capacity at KVK in digital pedagogy and sustainability education.

Weaknesses / Challenges

- Technical complexity and time demands of developing high-quality AR environments.
- Coordination challenges related to multilingual content and diverse educational contexts.
- Varied digital readiness among youth workers, affecting early pilot engagement.
- Limited capacity to assess long-term behavioural and career impacts within the project timeframe.
- Sustainability of digital platforms beyond project funding.

Lessons Learnt

The GreenYOU experience highlights that green-transition initiatives are most effective when learning is interactive, visually rich and connected to real-life challenges. Gamified and AR-

based approaches proved particularly successful in fostering motivation, collaboration and problem-solving. A key lesson is the importance of co-creation and interdisciplinary collaboration. Early and continuous involvement of educators, youth workers, learners and technical experts enhanced relevance, usability and ownership. Iterative design, pilot testing and feedback loops were critical for quality improvement.

If implemented again, more time would be allocated to early digital upskilling of educators. Despite these challenges, the project created lasting institutional impact at KVK by strengthening expertise in digital pedagogy, sustainability integration and international collaboration. Looking ahead, GreenYOU's open-access resources are being adapted for broader use in vocational training and adult education, positioning the project as a scalable model for aligning education with Europe's green transition goals.

4.4. Green Wall (Zelená stena)

Institution: Secondary vocational technical school Michalovce (SOSTMI)

Description of the Case

The *Green Wall (Zelená stena)* project was implemented at the Secondary Vocational School of Trade and Services in Michalovce with the main objective of creating a pleasant, harmonious and healthy environment for students and teachers. Additional goals included increasing plant biodiversity, enhancing the aesthetic quality of school premises and improving overall environmental conditions within the school.

The project involved the installation of a vertical green wall and the active engagement of students in its maintenance and care. Educational lectures and awareness-raising activities were organised to highlight the benefits of green walls for sustainability, indoor air quality and well-being.

The project addressed a wide range of target groups, including students, teachers, school staff, parents, primary school pupils and the wider community. Students were the primary target group, benefiting from improved learning conditions and gaining practical knowledge related to plants, ecology and sustainability. Teachers and staff experienced increased relevance of ecology and biology topics in teaching, while parents, primary school pupils and the local community were engaged through events, workshops and public lectures.

The project was implemented between November 2024 and June 2025 and included five core activities: planning and design, installation, educational activities, maintenance, and awareness-raising events.

Scope and Problem to Be Tackled

The school operates in a pavilion-based campus, with the main administrative building housing the canteen, cafeteria, economic department and school management. This building experiences the highest daily foot traffic and was therefore selected as the location for the vertical green wall to maximise impact.

The presence of the school canteen, combined with the lack of air-conditioning and mechanical ventilation, resulted in insufficient air circulation and a high concentration of vapours. The green wall was introduced as a response to these conditions, with the aim of improving indoor air quality, reducing dust and toxins, lowering noise levels and enhancing the microclimate.

The project required careful selection of plant species, environmentally friendly materials and appropriate irrigation and maintenance systems. By increasing indoor greenery, the initiative supported both environmental education and health-related improvements, offering students hands-on experience in plant cultivation, green wall maintenance and ecological principles.

Complementary educational activities, including lectures on sustainability and a study visit to the Botanical Garden in Košice, strengthened students' understanding of ecosystems, biodiversity and the role of greenery in environmental quality and mental well-being.

The project aligns with national, regional and local environmental strategies in Slovakia, contributing to biodiversity, air-quality improvement, CO_2 absorption, noise reduction and microclimate regulation. Beyond environmental benefits, the green wall serves as a practical educational tool embedded in the school's learning environment.

Steps Followed (Methodology)

During the planning phase, **professional literature and methodological resources** on vertical green walls, ecological design and planting technologies were reviewed. This desk research was complemented by consultations with garden architects, botanists and other experts.

Case studies of similar projects were analysed to identify suitable technical and design solutions. A baseline assessment of the selected site examined lighting conditions, environmental characteristics and vegetation suitability. Plant species were chosen based on ecological principles, biodiversity contribution and compatibility with the indoor microclimate.

Sustainable resource use was explored, including the potential use of domestic compost and garden soil. A detailed maintenance plan was developed, defining responsibilities, care routines and cost considerations.

The project budget was clearly defined. Funding from the Environmental Fund amounted to €4,384.71, with total costs reaching €4,429.00 and a small co-financing contribution from the school.

All activities were planned with clear objectives, outputs and timelines, ensuring structured implementation.

Project Activities Overview

Activity	Objective	Output
1. Planning and design	Develop a placement plan for the vertical green wall and prepare the project budget	Placement plan and approved budget for the vertical green wall
2. Procurement and installation	Select suitable plant species and involve students in the installation to strengthen ownership and responsibility	Installed vertical green wall with diverse plant species

Activity	Objective	Output
3. Educational activities	Organise a workshop on plant care and ecological benefits; visit an inspirational site	Completed workshop and study visit (Botanical Garden Košice), increased botanical knowledge
4. Maintenance and care	Establish a student group responsible for regular care and plant health monitoring	Regular maintenance, fertilisation, and care of the green wall
5. Events and awareness-raising activities	Promote the importance of vertical green walls as ecological and educational assets	Open day, public presentation, community engagement, project evaluation

Strengths and Weaknesses

Strengths

- Improved indoor microclimate and air quality
- Stress reduction, enhanced creativity and concentration
- Development of students' plant-care skills and responsibility
- Noise reduction, humidity stabilisation and dust capture
- Low operational complexity and relatively simple maintenance

Weaknesses / Challenges

- Requirement for continuous care and monitoring
- Uneven plant performance due to environmental conditions
- Relatively high initial investment costs
- Spatial and lighting constraints
- Administrative burden related to funding and reporting
- Maintenance challenges during school holidays

Lessons Learnt

Based on the key findings of the project, the following recommendations are proposed for other organisations planning to implement a similar initiative:

Area	Key Insight	Why It Matters
Strategic placement	Locating the green wall in the most heavily used building (main building with canteen and administration) and the area with the poorest microclimate was crucial to maximising impact.	The intervention addressed not only aesthetic goals, but also concrete health and operational challenges, such as insufficient ventilation in the canteen area.

Area	Key Insight	Why It Matters
Multifunctional benefits	The project delivered environmental, health (reduction of toxins and noise), educational (hands-on skills), and psychological (stress reduction) benefits.	A multifunctional approach increases acceptance among target groups and facilitates access to diverse funding sources.
Student involvement	Students were directly involved in installation, long-term maintenance, and accompanying activities (Botanical Garden visit, lectures).	This transformed the identified weakness of "regular maintenance requirements" into a learning opportunity and ensured clear responsibility allocation.
Administrative workload	The process of securing support from the Environmental Fund involved a high administrative burden.	Organisations must anticipate this workload and allocate sufficient time and human resources for bureaucracy, reporting, and documentation from the outset.

Diagnosis-First Approach

Based on project experience, the most effective recommendation is to begin with a **thorough analysis of the microclimate and functional needs of the space**, rather than focusing primarily on design. Before purchasing plants or structural elements, it is essential to clearly define the functions the green wall is expected to fulfil. In this project, the primary objectives were the reduction of vapours and improvement of air circulation in the canteen area; in other contexts, priorities may differ.

A recommended action step is to invest time in collecting **baseline environmental data**, such as temperature, humidity, and CO_2 levels in the target space (e.g. during peak use periods such as lunchtime). Based on these data, the appropriate system type (substrate-based versus hydroponic) and, most importantly, plant species can be selected according to their effectiveness in absorbing specific pollutants or regulating humidity.

Suggested Improvements for Future Projects

Based on the identified weaknesses and lessons learned, the following adjustments are recommended for similar future initiatives:

A. Integrate a holiday maintenance plan into the budget

Instead of relying on ad hoc solutions during summer holidays, a small automated irrigation system should be included in the initial budget (Activity 2), with one designated staff member (e.g. technician or caretaker) responsible for monitoring the system. This would significantly reduce the risk of plant loss.

B. Conduct pre- and post-installation measurements

Official measurements of indoor air quality (CO_2, humidity, temperature) should be carried out before installation (Phase 1 – Planning) and after installation (Phase 5 – Evaluation). This would allow the project's impact to be quantified and provide robust evidence of effectiveness for final reporting.

C. **Establish a "Green Team" with succession planning**

An official Green Team consisting of students and one teacher (ecology/biology) should be created, with a clear structure for transferring responsibilities to future student cohorts. This approach minimises the risk of uneven care over time.

Long-Term Institutional Impact

The initiative resulted in lasting change in three key areas:

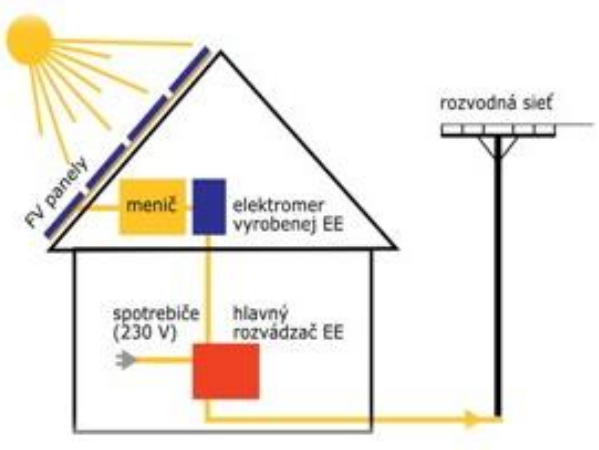
1. **Permanent environmental improvement** – The green wall has become a permanent feature in the most frequented school building, continuously improving air quality and aesthetics, and creating healthier conditions for learning and dining.
2. **Integrated educational tool** – Maintenance of the green wall is now embedded in practical ecology and biology teaching. The project functions as a living, evolving laboratory rather than a one-off intervention.
3. **Culture of responsibility and sustainability** – Students involved in maintenance have developed a tangible sense of responsibility for shared spaces, shifting environmental awareness from theory into everyday school practice.

4.5. Energy Audit of Our School

Institution: Secondary vocational technical school Michalovce (SOSTMI)

Description of the Case

This example of good practice was developed by students of the Secondary Vocational Technical School in Michalovce (Štefan Gorás, Šimon Ircha, Martin Holub, 2016), who carried out an energy audit of the school building. The project successfully represented the school in a regional competition organised by Východoslovenská distribučná, a.s., as well as in the national competitions *Stredoškolská odborná činnosť* and AMAVET, where it received a special award from the company GlobalLogic.



Beyond its competitive dimension, the project aimed to create a long-term educational resource for current and future students in the field of electrical power engineering. It focused on demonstrating alternative renewable energy sources, explaining their principles of operation, integration into the electrical grid, and analysing their advantages, disadvantages and investment payback periods.

Based on collected data, the students proposed measures to reduce the school's electricity consumption and increase energy self-sufficiency. The proposals emphasised reducing dependence on the distribution network through energy savings and renewable energy use, while identifying potential financial savings. The project therefore combined technical, economic and environmental perspectives and contributed to raising environmental awareness and interest in renewable energy technologies among students.

The project addressed solar energy (photovoltaic and solar thermal panels), wind energy and a simple but effective measure: replacing conventional light bulbs with LED lighting. Developed with a high level of technical detail, the project continues to be used in teaching as a practical example of reducing energy dependency and preparing energy-related projects.

The primary objective was to create an educational model demonstrating the use of renewable energy sources in a building, including implementation processes, investment costs and return on investment. The project involved students, teachers, future students, parents and professional audiences, and has no fixed timeframe, as it remains in continuous educational use.

Scope and Problem to Be Tackled

Prior to the project, the school lacked modern and innovative teaching aids reflecting current trends in vocational education and training. Specifically, there was no practical educational tool presenting renewable energy technologies, energy auditing processes or investment planning related to building energy self-sufficiency.

Identified challenges included:

- absence of a practical teaching aid for electrical engineering and high-voltage disciplines,
- lack of tools explaining operational principles and grid integration of renewable technologies,
- limited demonstration of planning and payback analysis for energy investments,
- shortage of educational resources addressing environmental and climate-related dimensions.

The project responded to these gaps by providing a hands-on educational model for students in electrical engineering programmes, who are increasingly expected to work with renewable energy technologies in their professional careers. The initiative aligns with the **European Green Deal** and broader sustainability goals by preparing students as future implementers of renewable energy solutions.

Steps Followed (Methodology)

The implementation process of the project was as follows:

Phase 1: Identification of Need and Motivation

Step	**Activity Description**	**Responsible Persons / Statement**
1.1 Identifying an opportunity	Identification of a competition organised by VSD, a.s., supporting projects in electrical engineering and electronics as a suitable framework for implementing the idea.	Subject teachers and students
1.2 Identifying a gap	Recognition that there was no teaching aid available in the field of energy auditing and renewable energy sources (RES).	Students and subject teachers
1.3 Defining the need	Establishment of the need for a teaching aid that would support familiarisation with this professional topic as part of preparation for future employment.	Students and subject teachers

Phase 2: Planning and Theoretical Preparation

Step	Activity Description	Responsible Persons / Statement
2.1 Formation of the project team	Creation of a team of students who would implement the project.	Students
2.2 Development of the plan and consultations	The student team began planning the project in cooperation with a vocational subject teacher acting as a consultant.	Students and teacher (consultant)
2.3 Collection of theoretical background	Searching for and collecting the necessary information and data for the theoretical part of the project, primarily using online sources.	Students
2.4 Definition of structure and objectives	Defining the structure of the work based on the demonstrative nature of the teaching aid and the objectives for which it would be used.	Students

Phase 3: Implementation and Financing of the Model

Step	Activity Description	Responsible Persons / Statement
3.1 Work management	Students independently managed and organised work on the project and the model.	Student team
3.2 Financing of materials	Initial financing of materials and components for the production of the model from the students' own resources.	Student team
3.3 Production and processing of the model	Practical implementation and production of the physical model of the teaching aid within the school premises.	Student team
3.4 Monitoring and guidance	Continuous monitoring and guidance of project preparation and implementation by the teacher-consultant.	Teacher (consultant)
3.5 Reimbursement of costs	Subsequent reimbursement of the students' expenses from the school's financial resources.	School (administration)

Presentation and Evaluation

The next step consisted of presentation and evaluation activities:

- submission of the completed project and model (teaching aid) to the VSD, a.s. competition and presentation before an expert jury and other competitors,
- submission of the completed project and model (teaching aid) to the SOČ competition and presentation before an expert jury and other competitors,
- submission of the completed project and model (teaching aid) to the AMAVET competition and presentation before an expert jury and other competitors,
- presentation of the model at the school's Open Day for prospective students of electrical engineering programmes, their teachers, and parents.

The initial idea to develop a project focused on energy auditing and the use of renewable energy sources arose from the absence of any teaching aid in this field and, at the same time, from the need to become familiar with this professional area as part of preparation for future employment. The need for a practical teaching aid was perceived both by vocational teachers and by students.

An opportunity to create such a teaching aid emerged through a competition organised by VSD, a.s., which supports young students in developing projects in the field of electrical engineering and electronics. Subsequently, the students formed a team and, in cooperation with a vocational subject teacher, began planning and implementing the project.

Since renewable energy sources and related topics are already part of the vocational curriculum and practical training, no changes to the curriculum were required.

Online sources were used as the main references for the theoretical background of the project. The structure of the work was determined by the demonstrative character of the teaching aid and the objectives for which it was intended. The model itself was produced by students at school and initially financed from their own resources, which were later reimbursed from the school's financial funds.

The preparation and implementation of the project were continuously monitored and guided by a teacher acting as project consultant. The students independently managed the work on both the project and the model.

Strengths and Weaknesses

Strengths

- Strong motivational impact on students in electrical engineering programmes
- Increased awareness of sustainability and renewable energy technologies
- Demonstration of energy savings, cost reduction and self-sufficiency potential
- Practical guidance on installation and operation of renewable technologies
- Clear presentation of investment costs and payback periods
- Long-term use as an educational tool

Weaknesses / Challenges

- Simplifications compared to real-life installation conditions
- Market price fluctuations affecting long-term cost projections
- Technical and financial constraints related to model development
- Need for regular monitoring and maintenance
- Risk of knowledge transfer gaps as student teams change over time

Lessons Learnt

In summary, the development of a teaching aid focused on new technologies—especially those related to sustainability and environmental protection—for students in electrical engineering programmes can have a significant impact on their motivation to apply these technologies in practice.

The earlier students become familiar with the operation and advantages of renewable energy sources, their installation, and the possibilities of self-sufficiency in electricity production, and the more clearly they understand the benefits for individual consumers as well as for society as a whole, the higher the likelihood that they will adopt, use, and prioritise these forms of electricity generation in their future professional careers.

We therefore recommend supporting students' interest in developing projects and assignments focused on innovation in the field of electrical engineering, even in the form of teaching aids. Such activities contribute to raising students' awareness and, ultimately, to ecological and economic sustainability and environmental protection.

Overall Evaluation of the Energy Audit in the Project

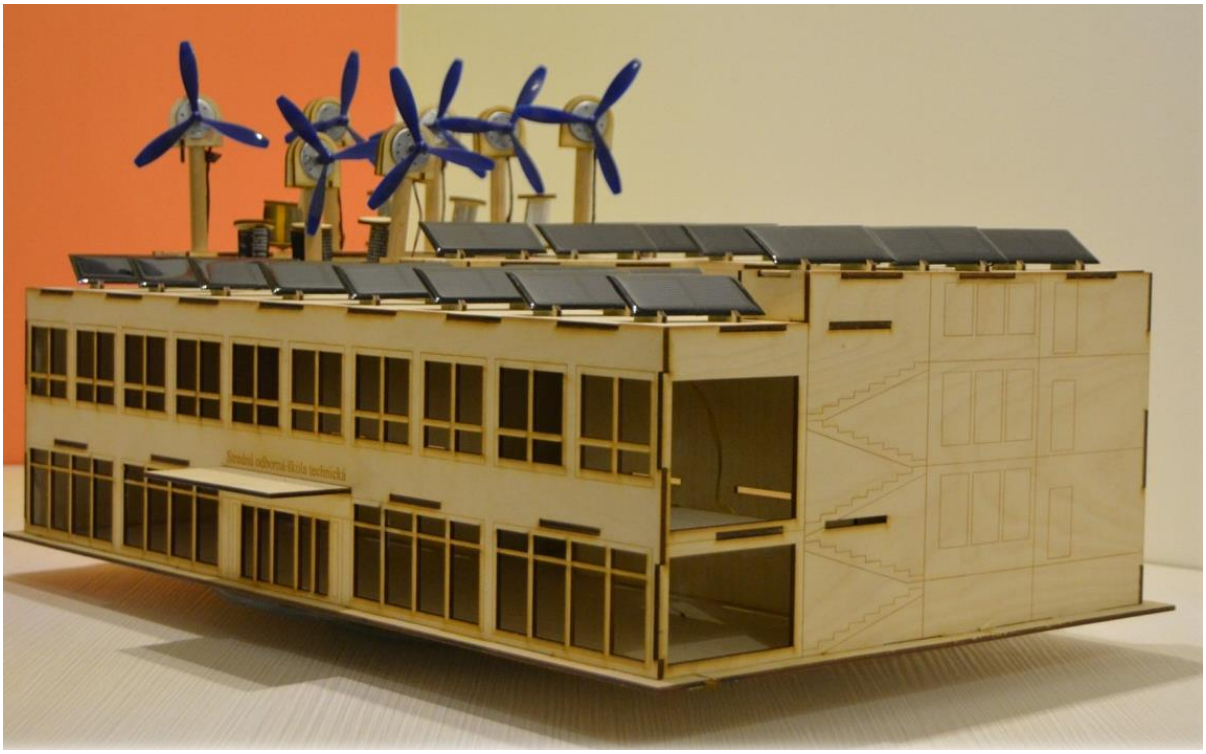
Measure	**Photovoltaic Panels (Solar Energy)**	**Solar Thermal Panels**	**Wind Energy**	**Replacement of Bulbs with LED**	**Total**
Estimated annual energy savings [kWh]	25,500	4,025.00	3,291.84	13,093.5	45,910.34
Estimated annual cost savings [€]	3,320.40	523.25	427.93	2,862.00	7,133.58
Estimated annual savings [%]	46.5	7	6	40.12	25
Estimated savings over 20 years [€]	66,408.00	10,465.00	8,558.60	57,240.00	142,671.60

Measure	Photovoltaic Panels (Solar Energy)	Solar Thermal Panels	Wind Energy	Replacement of Bulbs with LED	Total
Payback period [years]	5–6	7	32	1	—
Estimated investment costs [€]	14,920.00	3,495.72	14,000.00	1,290.00	33,705.72

It is essential that students are exposed to sustainability-related topics as broadly as possible, as regular engagement with such issues strengthens their ability to apply them effectively in their future professional practice. Simple, practical and efficient solutions should be prioritised, such as the proposed replacement of conventional light bulbs with LED lighting.

The school plans to test this measure in practice, allowing students to verify the project's assumptions and results in a real setting. Through this initiative, students of electrical engineering programmes gain hands-on experience with renewable energy sources and energy-efficiency solutions.

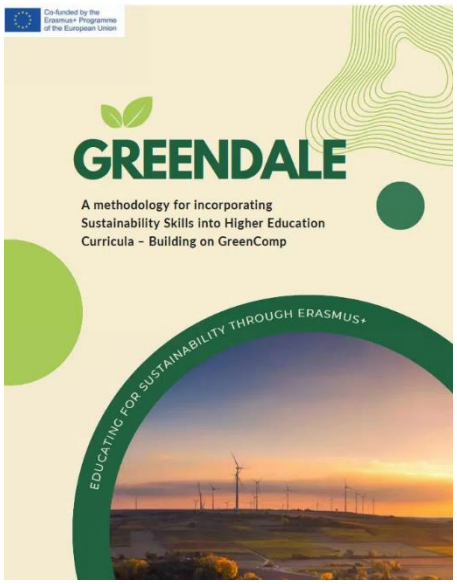
The model developed within the project will continue to be used as a teaching aid in vocational education. In parallel, the school's governing body has initiated a broader renovation project focusing on sustainability and the use of renewable energy sources, particularly photovoltaic systems. Although this initiative is still at an early stage, it reflects the longer-term impact and relevance of the student project.



4.6. Incorporating sustainability skills into higher education curricula

Institution: Technical University of Kosice (TUKE)

Description of the Case



The Faculty of Economics at the Technical University of Košice (Slovakia) coordinates the GREENDALE project (GREEN Dimension: Adapting Learning in Higher Education, project no. 2024-1-SK01-KA220-HED-000243273), a three-year **Erasmus+ initiative** running from November 2024 to October 2027.

The project aims to develop sustainability competencies among higher education students across disciplines, building on the European GreenComp framework. Its objectives include modernising curricula to integrate sustainability skills, strengthening the capacity of academic staff to embed sustainability in teaching, designing sustainability-oriented internships, and enhancing the role of company mentors in cultivating green skills.

During the first project year, the focus was on curriculum development and the integration of sustainability dimensions into existing courses. This process was guided by two key deliverables—a Methodology and a Handbook for Higher Education Teachers—which provide practical guidance for embedding sustainability into teaching and learning. Based on these tools and teacher training activities, the Faculty of Economics began piloting an updated Marketing course within the Bachelor's programme during the winter **semester 2025**. Following evaluation and feedback, two courses (Marketing and Statistical Methods in Economic Sciences) will be accredited as part of TUKE's standard curriculum.

Scope and Problem to Be Tackled

Higher education plays a critical role in preparing future professionals to respond to environmental crises and labour market demands related to the green transition. Despite growing strategic commitments, sustainability often remains marginal within curricula and teaching practice.

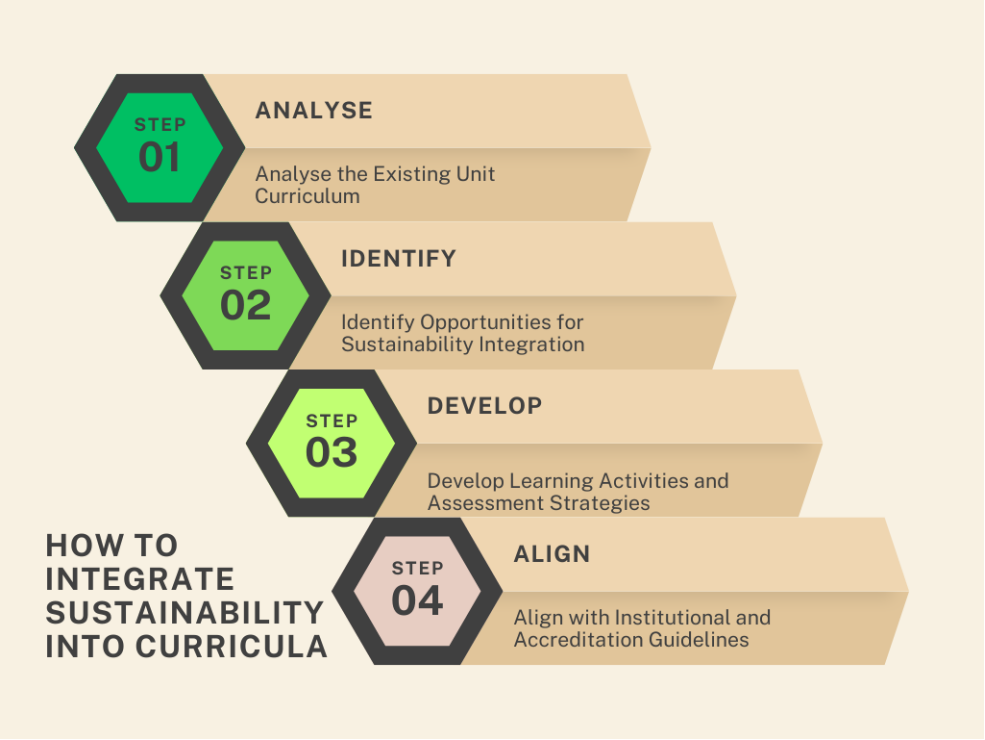
The GREENDALE initiative was developed to address this gap by supporting teachers in systematically integrating sustainability competencies into their courses. It seeks to ensure that students acquire not only knowledge, but also the skills, values, and attitudes required to address complex sustainability challenges in professional contexts.

The initiative responds to interconnected needs:

- **Students** gain practical sustainability competencies such as systems thinking, ethical reasoning, and adaptability.
- **Educators** receive structured, user-friendly guidance for course redesign.
- **Industry and society** benefit from graduates better prepared for sustainability-oriented labour markets.

The project aligns with the university's commitment to the SDGs and broader European green transition priorities, using the GreenComp framework as a reference for curriculum development.

Steps Followed (Methodology)



*Integration of sustainability into curricula (*Figure created by N. Hadidomova)

A structured a Methodology for Teachers was developed to guide course revision across disciplines in line with GreenComp. This was complemented by a practical Handbook offering step-by-step guidance, teaching tips, templates, and annexes to support course redesign.

In September 2025, a teacher training event introduced academic staff to the Methodology, Handbook, and GreenComp framework, enabling hands-on revision of their own courses. The Marketing course was selected as a pilot and underwent a sustainability audit covering learning outcomes, content, teaching methods, assessment, and feedback mechanisms.

Learning outcomes were reframed by combining Bloom's Taxonomy with GreenComp competence areas. Sustainability concepts were embedded across core marketing topics, including green consumer behaviour, greenwashing, and circular design principles, supported by real-world case studies. Learning activities were adapted to include value-chain analysis

and proposals for reducing environmental impacts. Assessment methods were revised to evaluate not only knowledge acquisition, but also students' ability to apply sustainability competencies such as systems thinking and collaboration.

Following the pilot, alignment with internal quality assurance standards will be reviewed and accreditation procedures initiated.

Strengths and Weaknesses

Since the pilot is still ongoing, the following were the strengths and weaknesses identified thus far:

Strengths
The availability of a clear Methodology and a practical Handbook enabled lecturers to integrate sustainability in a structured and accessible way. Teacher training supported immediate application to real courses, while piloting a single course reduced risk and created a concrete example for wider institutional learning. Real-life case studies and interactive activities proved particularly effective in linking theory with practice.

Weaknesses / Challenges
Translating GreenComp competencies into clear, measurable learning outcomes and assessments was demanding and time-consuming. Additional workload was required to align learning outcomes, rubrics, and accreditation requirements. In disciplines where sustainability is not traditionally central, integration required careful change management and sustained institutional support.

Lessons Learnt

Key Takeaways
Institutions are advised to start with pilot courses, support staff with clear methodological tools, and invest in training before large-scale curriculum reform. Collaboration with external partners enhances relevance and student engagement.

What to Do Differently
More time would be allocated early on to developing shared assessment rubrics and examples of measurable learning outcomes linked to GreenComp.

Lasting Impact
The initiative increased sustainability awareness within the Faculty of Economics and demonstrated that sustainability can be embedded as a practical, integral element of teaching. It strengthened staff capacity and collaboration with external stakeholders, and the tools developed are now referenced as good practice by other departments.

Next Steps
Following evaluation and accreditation of the pilot courses, trained teachers will lead in-house workshops to share know-how. The Methodology and Handbook will become institutional resources, supporting wider curriculum reform, staff training on GreenComp, and expanded partnerships for sustainability-focused internships.

Furthermore, the university plans to:

- Incorporate sustainability criteria into its internal curriculum development procedures;
- Start offering teacher training on the GreenComp framework and on integrating sustainability skills into the curriculum;
- Continue building partnerships with local businesses and NGOs to support sustainability-focused internships.

4.7. ECO-JOBS — “Eco Innovation for VET Students”

Institution: Peiramatiki SAEK Glyfada’s

Description of the Case

ECO-JOBS — “Eco Innovation for VET Students” is an international collaborative project (partners in Italy, Spain, Germany and Greece) coordinated in Greece by **DIMITRA Educational Consulting** (Vocational Training Institutes with branches in Larissa, Athens, Thessaloniki, etc.). The initiative aims to equip VET learners and trainers with the skills, mindsets and practical experience needed for new and emerging green jobs through eco-innovation activities, business-simulation methods and practical learning paths. Activities include mapping green job opportunities, creating educational materials (video lectures, digital toolkits), and enabling students to form cross-border teams to design and prototype sustainable start-up ideas. The project explicitly targets pedagogical innovation for VET: combining entrepreneurial thinking, sustainability literacy and hands-on practice to make graduates job-ready for the green economy.

Scope and Problem to Be Tackled

Greece — like many EU countries — faces a skills mismatch between VET outputs and the rapidly developing green labour market. Regions with renewable potential (e.g., Crete, Thessaly) and tourism-dependent islands need workers trained in energy systems, circular-economy practices, sustainable hospitality and eco-entrepreneurship. ECO-JOBS tackles several interrelated problems:

- **Skills gap**: existing curricula lack explicit green-job profiles and teaching materials that combine sustainability + entrepreneurship.
- **Low practical exposure**: many VET students do not have structured opportunities to design, test and pitch green business ideas or prototypes.

Teacher capacity: VET trainers need updated resources and methods for teaching green innovation.

ECO-JOBS addresses the problems at the VET-institution level (materials, teacher training) and at the student level (practical, market-oriented activities). The project’s scope includes digital learning resources, teacher upskilling and pilot student cohorts developing green business ideas that can be tested in local ecosystems.

Steps Followed (Methodology)

The project follows a multi-phase, practice-driven methodology likely useful as a replicable model for other Greek VET schools:

1. **Stakeholder mapping & needs analysis**

Survey of regional green labour markets and consultation with local employers (renewables, agri-tech, sustainable tourism). Project documentation indicates partner mapping across Italy/Spain/Greece.

2. **Design & development of learning assets**

Creation of modular digital content (video lectures, teaching guides) and a green jobs taxonomy aligned with local contexts. Materials aim to be adaptable across VET specialisms (energy, tourism, agriculture, digital).

3. **Teacher training / capacity building**

Short courses and workshops to introduce experiential methods (business simulation, lean start-up applied to green ideas), assessment rubrics for eco-competences, and guidance for local adaptation.

4. **Student activation — project-based learning**

Student teams (national & transnational) form to identify a local environmental or green-business opportunity, prepare a business model, prototype a solution (service/product), and pitch to local stakeholders (municipalities, SMEs). This bridges VET technical training with entrepreneurship and sustainability.

5. **Piloting & evaluation**

Pilots run in partner sites. Teachers and industry mentors provide feedback; outcomes (skills gained, prototypes developed, internships arranged) are collected for iterative improvement.

6. **Dissemination & scaling**

Results (materials, toolkits, lessons) are shared online for replication by other VET institutions; partners engage regional networks and education authorities to encourage uptake.

7. **Design & development of learning assets**

Creation of modular digital content (video lectures, teaching guides) and a green jobs taxonomy aligned with local contexts. Materials aim to be adaptable across VET specialisms (energy, tourism, agriculture, digital).

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Strengths and Weaknesses

Strengths

- **Direct labour-market orientation:** co-design with partners ensures relevance to real green roles and new job profiles.
- **Practical, student-centred approach:** business simulations and team projects actively develop both technical and transversal green competences.
- **Replicable digital assets:** modular materials (videos, guides) enable scaling across VET sectors and regions.
- **EU partnerships:** transnational collaboration lets students access diverse practices and cross-border mentoring.

Weaknesses / constraints

- **Limited published quantitative impact (publicly available):** the public announcement describes aims and activities but published numeric outcomes (e.g., number of students certified, jobs created, energy/waste savings) are not on the public news page.
- **Sustainability of pilots depends on local buy-in:** converting prototypes into lasting jobs/businesses requires follow-up support (seed funding, incubation).
- **Teacher workload & capacity:** teacher training is essential — without incentives/time allocation, diffusion may stall. Lessons Learnt

Lessons Learnt

1. **Blend technical training with entrepreneurship** — VET curricula that combine sectoral skills with green business modelling increase employability and create pathways for student-led green enterprises.

2. **Use modular digital teaching assets** — produce adaptable videos and toolkits so schools with different resources can adopt the same core content. ECO-JOBS explicitly produces these resources.

3. **Engage local employers early** — employers help define the green job profiles and host practical placements that make training relevant.

4. **Monitor and publish impact metrics** — to secure ongoing funding and institutional buy-in, projects should collect and share numbers: students trained, internships, business pilots incubated, teachers trained, and (if relevant) resource savings from implemented prototypes.

5. **Plan post-pilot support** — allocate resources for incubation, mentorship and local networking to turn student prototypes into sustainable local businesses or employment pathways.

Quick verification sources

● DIMITRA (ECO-JOBS project news page). ΔΗΜΗΤΡΑ Εκπαιδευτική Συμβουλευτική ΑΕ

● GreenVET Pathway (EU project supporting whole-institution approaches in VET; Greece is a participating country). green-vet.eu

● Green Hive / GreenComp national report (context on green competences & VET in Greece). greenhiveproject.eu

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