European Commission

GreenComp in practice: case studies on the use of the European competence framework

Analytical report

Education and Training

GreenComp in practice: case studies on the use of the European competence framework

Analytical report

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Abstract

This report presents findings from a study conducted by Technopolis Group and 3S on behalf of the European Commission, focusing on the uptake and implementation of the GreenComp framework across various educational settings. GreenComp, developed by the European Commission, serves as a reference guide aimed at fostering competences to address sustainability and environmental challenges. Through a combination of desk research, expert interviews, an online survey, and stakeholder consultations, the study explores motivations for using GreenComp, the process of its application, and initial results. Twelve in-depth case studies highlight diverse implementation modes, activities, enabling factors, challenges, and transferability aspects. Recommendations for future developments and adaptation of GreenComp emphasize practical translation, enhanced dissemination, support through use cases and Communities of Practice, and the maintenance of its dynamic nature. These recommendations aim to facilitate the widespread adoption and effective utilization of GreenComp to promote sustainability competences in diverse educational contexts.

Executive Summary

Highlighting the urgent need for a shift in human behaviour and mindset to address the climate and environmental crises, GreenComp was introduced as a **reference guide developed by the European Commission to foster a shared understanding of sustainability competences**. The overall **scope and objectives** of this study, carried out by Technopolis Group and 3S on behalf of the European Commission, were to explore the uptake of GreenComp across various educational settings through a series of case studies. More specifically, the study addresses the following aims:

- Capture the **motivations for using GreenComp** and other alternative sustainability competence frameworks,

- Record the **process of using GreenComp** including opportunities and challenges in its application,

- **Collect initial and expected results** of the application of using GreenComp in diverse education settings,

- Offer **recommendations** regarding the further uptake by education stakeholders at national and EU levels as well as the dissemination and development of GreenComp.

The **methodology** for the implementation of this study combined:

- An **initial mapping** of projects, initiatives and organisations using GreenComp: 56 initiatives were mapped via expert interviews, an online survey of the GreenComp Community of Practice and desk research.

- Desk-based research and interviews on the wider context of GreenComp and on various **other sustainability competence development frameworks**. The identified additional competence frameworks that exist in the sustainability landscape are categorised into three main groups: those focusing solely on sustainability competences, those integrating sustainability with entrepreneurship-related competences, and those targeting educators for sustainability education.

- The development of **12 in-depth case studies** via desk-based research and a series of stakeholder consultations on the use of GreenComp across various levels of education.

- The analysis and synthesis of all the information collected and its presentation in this analytical report, which showcases **good practices and lessons learned** regarding the use of GreenComp and puts forward recommendations to support the further take up of the competence framework.

Key findings

The identified **initiatives using GreenComp span a wide spectrum**, from individual efforts to large-scale international projects. They cover all educational levels including school education, vocational education and training, higher education, and adult learning as well as non-formal and informal education. The **diversity of approaches and motivations of using GreenComp** highlight the framework's adaptability and utility across different educational contexts. The initiatives cover a broad geographic distribution across the EU Member States, with some concentration in Finland, Greece, Italy and Spain.

The **analysis of the 12 GreenComp case studies** showcases a diverse range of implementation modes, types of activities as well as enabling factors, challenges and transferability:

- The **extent to which GreenComp competences are embedded and implemented** varies across initiatives, with some projects focusing solely on sustainability competences while others integrate multiple competence frameworks.

- The **type of activities highlighted in the case studies** include the collection and dissemination of good practice examples, inclusion of sustainability competences in qualification frameworks, development of assessment tools, creation of learning materials, tailored training for educators, curriculum updates, and establishment of online platforms for knowledge exchange.

- **Enabling factors** for the successful application of GreenComp include its role as a common language for sustainability competences, its versatility and adaptability, and the expertise and mindset of the individuals involved. **Challenges** include translating the framework to diverse educational levels, ensuring adaptability to different contexts, and addressing resource intensity in terms of time requirements. **Transferability** is facilitated by best practices, collaborative processes, flexible methodologies, multidisciplinary approaches, and accessible tools and resources, as demonstrated across the case studies.

Recommendations

The **main recommendations for future developments and adaptation** of the GreenComp framework encompass four key areas:

- Firstly, there is an emphasis on **supporting the translation of GreenComp into practical application** by providing comprehensive guidance, creating user-friendly materials, and organising training to showcase its implementation.

- Secondly, **enhancing dissemination efforts** is crucial, leveraging targeted communication strategies and collaborating with stakeholders to raise awareness about GreenComp.

- Thirdly, **supporting the uptake through use cases, good practices**, and Communities of Practice is vital, facilitating the sharing of experiences and fostering collaboration among stakeholders.

- Finally, **maintaining the 'Living Document Nature'** of GreenComp is essential, ensuring its dynamic and responsive nature through regular updates and feedback mechanisms to sustain its relevance and applicability over time.

These recommendations aim to promote the widespread adoption and effective utilisation of GreenComp in fostering sustainability competences across diverse educational settings.

Figure 1 Study recommendations regarding the uptake as well as the dissemination and further development of GreenComp

Support the translation of GreenComp into (practical) application

Enhance dissemination efforts

Support the (further) uptake through use cases, good practices, and the Communities of Practice

Maintain the 'living document nature'

Source: Technopolis Group 2024.

1. Introduction to the study

The European Commission has long been at the forefront of **global efforts to address climate change, biodiversity loss, and other pressing environmental issues**. However, the magnitude and urgency of the challenges we face demand a paradigm shift in how we approach sustainability. Transitioning to a greener, more resilient economy and sustainable society requires not only technological innovation and policy reform but also a fundamental transformation in human behaviour and mindset. As our world faces **pressing challenges related to climate change and the environment**, the need for individuals to enhance their knowledge, skills, and attitudes to live, work, and act sustainably has become paramount.

Against this backdrop, the **concept of sustainability competences** has emerged encompassing a broad range of abilities, knowledge, and values that enable individuals to understand, assess, and respond to climate and environmental challenges effectively. At the same time, green competences embrace the complexities of the modern world in a way that is both **environmentally responsible** and **socially inclusive**. **GreenComp, the European sustainability competence framework** developed by the European Commission, serves as a reference guide for sustainability competences. Its purpose is to provide a common foundation for learners and offer guidance to educators, fostering a shared understanding of what sustainability entails as a competence.

The European Commission (EC) launched this study with the **aim** to identify and analyse a set of initiatives and projects that have been using the GreenComp framework. The findings of this study and the 12 case studies developed as part of it are presented in this report. The study was carried out by Technopolis Group in collaboration with 3s between November 2023 and April 2024.

The report is structured into **three main chapters** and includes the set of **case studies** developed as an **annex**:

- **Chapter 1** provides a **brief description of GreenComp**, the subject of this study, and subsequently provides an overview of scope, objectives and the methodology of the study.

- **Chapter 2** provides the **key findings** of the study. The chapter starts with a review of various sustainability competence frameworks that have been developed over the years as a context to the key findings on the use of GreenComp.

- **Chapter 3** puts forward **recommendations** based on the findings of the study regarding the future development and adaptation of the GreenComp framework.

1.1 Description of the GreenComp European sustainability competence framework

The policy context of GreenComp

The **European Education Area (EEA)** covers and continuously develops its policy through six dimensions: quality of education and training, inclusion and gender equality, green and digital transitions, teachers and trainers, higher education and geopolitical dimension. The Council Resolution on the European Education Area,[1] identified supporting the digital and **green transitions in and through education** and training as one of its strategic

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[1] Council Resolution on a strategic framework for European cooperation in education and training towards the European Education Area and beyond (2021-2030)

priorities. The **European Green Deal,**[2] Europe's overarching strategy to become climate neutral by 2050, acknowledges the significant role of education and learning in reaching that goal.

Another driver of educational transformation is the **EU Skills Agenda**[3],which seeks to further enhance the quality, relevance, and inclusiveness of education and training systems across the EU. By prioritising **digital and green skills**, the EU Skills Agenda aligns with the broader objectives of the EEA and the European Green Deal, fostering a generation of environmentally conscious and digitally adept citizens capable of driving sustainable development and innovation.

In 2022, EU Member States adopted a **Council Recommendation on learning for the green transition and sustainable development**.[4] It highlights that there is a need for education and training to implement actions to support the green transition both in its own operations and in how it prepares learners for the future. Individuals of all ages need to prepare and actively take part in fostering the green transition and sustainability. System level efforts should address further investments in **green** and **sustainable education** including among others, equipment, resources and infrastructure, and the overall learning environments. The Council recommendation is supplemented by a **Commission staff working document**[5] that provides detailed analysis on the policy progress and approaches to learning for sustainability in the EU Member States and presents examples of good practices from across Europe.

To bring about changes in the education system towards learning for sustainability, the European Commission established within the Working Group on Schools, the **Sub-group Learning for Sustainability**, and the **Working Group on Vocational Education and Training and the Green Transition.** These working groups specifically address sustainability, climate and environmental concerns, recognising the need to integrate sustainability principles and practices into education. Learning for sustainability is supported by various **initiatives as well as funding** – dedicated to climate and sustainability education. One such initiative is the **Education for Climate Coalition**,[6] launched by the European Commission in 2021 with the aim to promote the green and digital transitions of education and training throughout the EU. This Coalition is a participatory platform for both individuals and organisations and is aimed at facilitating cooperation and collaboration and mobilising concrete action for environmental sustainability education and training.[7]

Learning for sustainability links to and builds on other similar agendas, including environmental education, sustainability education, climate change education, peace education, global education and education for sustainable development (ESD). Like learning for sustainability, all these concepts share a vision of education and learning that is transformative, embraces change and promotes sustainability. They also all recognise the interconnected nature of environmental, social, and economic issues.

Moreover, education systems across EU countries have undergone a significant shift towards a competence-based approach since the early 2000s. This **paradigm shift towards key competences for lifelong learning**, recognises the need to equip learners

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[2] European Parliament resolution of 15 January 2020 on the European Green Deal (2019/2956(RSP))

[3] COM (2020)274 EU - Communication European Skills Agenda for sustainable competitiveness, social fairness and resilience

[4] Council Recommendation of 16 June 2022 on learning for the green transition and sustainable development 2022/C 243/01

[5] European Commission, Directorate-General for Education, Youth, Sport and Culture, Learning for the green transition and sustainable development – Staff working document accompanying the proposal for a Council recommendation on learning for environmental sustainability, Publications Office of the European Union, 2022, https://data.europa.eu/doi/10.2766/02392

[6] https://education-for-climate.ec.europa.eu/community/

[7] Education for climate coalition - Publications Office of the EU (europa.eu)

with a comprehensive set of competences essential for navigating the complexities of the modern world.[8] The key competences encompass not only traditional academic knowledge but also skills, attitudes, and values essential for personal fulfilment, active citizenship, and employability in the 21st century. The identified key competences are the basis for different competence frameworks, which provide a common methodology and concept of what competences are (knowledge, skills, attitudes).

The European sustainability competence framework, GreenComp

GreenComp was developed to provide guidance on sustainability as a competence to learners of all ages, types (formal, non-formal, informal) and levels of education as well as their educators. The GreenComp framework is conceived as a "**living document**", implying a **dynamic and adaptable nature**, which allows for flexible adoption in diverse contexts. This adaptability underscores the framework's significance in terms of responsiveness and relevance and contributes to ensuring its continued utility amid evolving educational landscapes and sustainability imperatives.

GreenComp puts forward a shared understanding and a definition of what sustainability as a competence should entail in a form that can be used in a wide variety of settings and by different individuals and organisations:

> *"A **sustainability competence** empowers learners to embody sustainability values, and embrace complex systems, in order to take or request action that restores and maintains ecosystem health and enhances justice, generating visions for sustainable futures." Source: GreenComp statement on the definition of a sustainability competence[9]*

GreenComp encompasses **four closely interrelated competence areas** and **12 competences** for individuals to use as a reference framework.

Figure 2 GreenComp competence areas and competences

Competence areas	Competences
Embodying sustainability values	▪ Valuing sustainability ▪ Supporting fairness ▪ Promoting nature
Embracing complexity and sustainability	▪ Systems thinking ▪ Critical thinking ▪ Problem framing
Envisioning sustainable futures	▪ Futures literacy ▪ Adaptability ▪ Exploratory thinking
Acting for sustainability	▪ Political agency ▪ Collective action ▪ Individual initiative

Source: Bianchi, G., Pisiotis, U., Cabrera Giraldez, M. GreenComp – The European sustainability competence framework. Bacigalupo, M., Punie, Y. (editors), EUR 30955 EN, Publications Office of the European Union, Luxembourg, 2022.

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[8] European Commission, Directorate-General for Education, Youth, Sport and Culture, Looney, J., O'Shea, M., Staring, F. et al., Key competences for all – Policy design and implementation in European school education – Final report, Publications Office of the European Union, 2022, https://data.europa.eu/doi/10.2766/1951

[9] Bianchi, G., Pisiotis, U., Cabrera Giraldez, M. GreenComp – The European sustainability competence framework. Bacigalupo, M., Punie, Y. (editors), EUR 30955 EN, Publications Office of the European Union, Luxembourg, 2022

Figure 3 Visualisation used for the GreenComp competence areas and competences

Source: ibid.

Hypothetical use cases as well as knowledge, skills and attitudes statements accompany the description of the 12 competences in the publication. The take-up of the competence framework is supported by its availability in all official EU languages as well as by a growing community of practice (CoP).[10]

1.2 Scope and objectives of the study, main questions of enquiry

This study **explores the take-up of GreenComp** in different settings and levels of education through a set of 12 case studies, trying to answer why and how GreenComp is being used, hence supporting sustainability competence development. The case studies address how different education and training system stakeholders engage with GreenComp, as well as what key challenges and enablers of change they have found when using GreenComp. The main research questions to approach the task can be summarised along five topics of enquiry as shown in the table below.

Figure 4 Main study questions and sub-questions

Topics of enquiry	Sub-topics
Motivations for using GreenComp and other alternative sustainability competence frameworks	▪ Awareness about GreenComp and other frameworks ▪ Motivations for using GreenComp ▪ Expectations regarding GreenComp

The **process** of using GreenComp	▪ Key challenges and enablers:
	  ▪ At the initial take up / adaptation phase – inputs and support
	  ▪ During the implementation – activities

Initial and **expected results**	▪ Outputs and outcomes so far ▪ Expected results and impacts

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[10] https://education-for-climate.ec.europa.eu/community/GreenCompCommunity

Next steps in using GreenComp	▪ Monitoring the results
Transferability of the approach	• Key success factors and transferability of the approach

Source: Technopolis Group 2024.

In line with the main goals of the study, the developed case studies have dual objectives:

▪ To **showcase good practice** examples of the ways GreenComp can be used by different stakeholders, the motivations for using a competence development framework and the expected results.

▪ To seek **lessons learnt and develop recommendations** that can be shared with education stakeholders, including national and EU policy makers, educators and learners to support the further uptake of GreenComp.

The **scope of the study** entails all levels of education, primary and secondary education, higher education and vocational education and training and non-formal education.

1.3 Brief overview of the methodology

The study methodology combined primary and secondary data collection undertaken as **desk-based research** and **stakeholder consultations.** The development of **12 case studies** that serve both illustrative and analytical purposes is at the core of the study.

Desk-based research was used to:

▪ Review any **available documentation** and **information** on the use of GreenComp to better understand the types of and the ways how different stakeholders engage with GreenComp. This included documentation received from the European Commission and the publicly available database of Erasmus+ funded projects focusing on green competences and skills, funded since 2022 when GreenComp was launched.

▪ **Identify additional national, regional and international initiatives** that benefited from the GreenComp framework. The online research was carried out by using a set of keywords[11] in different EU languages.

▪ **Review academic and grey literature** to seek information on **other competence frameworks** focusing on sustainability to compare them to GreenComp.

▪ **Collect detailed information** on the projects to carry out an in-depth review of all publicly available documentation (e.g. project website, newsletters and deliverables) as well as further materials shared by the interviewees as part of the **case study research.**

Stakeholder consultations were carried out throughout the study to complement and elaborate on the findings of the desk-based research in various forms targeting different stakeholder groups:

▪ **Seven scoping interviews** were carried out with staff from the European Commission - Joint Research Centre and Directorate General for Education, Youth, Sports and Culture - as well as with external experts who were involved in the development of GreenComp. The semi-structured online interviews provided context

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[11] E.g. GreenComp Framework; Green Competences; Environmental Competences; Sustainable Competences; Competence-based Education for Sustainability; European Union Green Competences; Green Skills Development; Sustainability Education Framework; Green Curriculum Development; Environmental Education Initiatives

to the study and highlighted the expectations and the 'ideal or intended' use of GreenComp by its creators. The interviews also helped identify potential case studies for the study.

▪ A short, six question-long **online survey** was launched for the GreenComp Community of Practice (CoP). The objective of the survey was to seek additional information on the use of GreenComp and other sustainability competence frameworks by the broader Community of Practice. The survey was posted on the website of the CoP on the 6th of December 2023, and it remained open until the end of 2023. It was also reposted in the Christmas newsletter of the CoP to increase participation. In total, 15 individuals have provided input. The results of the survey fed into the finalised case study selection.

▪ Participation in the **GreenComp CoP Café conversations –** the study team members participated in these online events on a monthly basis, where they provided short presentations of the study and its progress and sought input to the identification of potential additional case studies.

▪ **Interviews** with a wide range of stakeholders were conducted as **part of the case study research**. Across the case studies 36 individuals were contacted with an interview request, and in total 32 interviews were conducted.

As described above, the case study research and analysis represent the backbone of the study. Two types of case studies were implemented:

▪ **Eleven single initiative or organisation focused case studies** were prepared that explored how stakeholders engaged with GreenComp and the results of these activities in their respective contexts.

▪ **A comparative case study** was prepared focusing on the regional and national application of GreenComp in Finland and France respectively. The case study analyses and contrasts how each country has engaged with the GreenComp Framework within their educational systems. By comparing these experiences with GreenComp, insights into how contextual factors shape the implementation and engagement with a sustainability education framework are highlighted. The comparison also provides insights into the role of government in promoting sustainability education and fostering collaboration among stakeholders.

The case studies were carried out by the study team following a **case study protocol** that set out the objectives and types of the case studies (single and comparative), the methodology for the methodology for the case study research (including available contact details and information already obtained) and the case study template. To ensure that a range of different initiatives could be featured in the study, the following case study selection criteria were applied:

▪ **Level and type of education** - primary, secondary, VET, higher education and non-formal education.

▪ **Type of organisation** – based on the key characteristics of the organisations (e.g. size, public vs private).

▪ **Geographical location of the organisation** - the case studies focus on EU Member States but, due to the small number of case studies, not all Member States can be represented in the selection. Nevertheless, a wide geographical diversity was ensured in order to reflect on the diversity of the contexts.

▪ **The existence of supporting contextual conditions** - e.g. enabling factors present in the environment of the framework's take up (e.g. cultural, political, education-system related) - were considered for the selection of comparative case studies.

▪ **Time and frequency of use of GreenComp –** i.e. sufficient time elapsed since users' initial take-up of the framework to see results and possible outcomes. Due to the relatively recent launch of GreenComp (January 2022) most of the initiatives are in their early stages, therefore only initial results could be observed as yet. However, the case studies provide rich information on the diversity of the possible uses of the GreenComp framework.

Based on these criteria, the study team selected a set of initiatives as case studies as included in Figure 5 List of case studies.

Figure 5 List of case studies

Name of the initiative	Summary	Level of education	Types of organisations	Geographical coverage
Single case studies				
Digital Environmental Education in VET (DEED) project	The Erasmus+ funded project is developing a green competence training programme, aligned with GreenComp. The training is structured into micro-lessons to allow VET teachers and trainers to pick and choose and incorporate them into their teaching.	VET	Private – training providers	Czechia, Italy, Romania, Spain, Poland, Portugal and Germany
TAP-TS – Developing sustainability competences among teachers, student teachers, and teacher educators	TAP-TS is an Erasmus+ Teacher Academy that is developing Learning & Teaching Packages consisting of seven open resource online courses and a Teacher Learning Programme. GreenComp is a main building block for the project's activities.	School education	Both public and private: HEIs, schools, a public authority, private companies, a CSO	Czechia, Germany, Italy, Poland, Portugal, Romania, Spain
GreenComp Enterprises - Boosting the start-up of green and ethical enterprises, based on GreenComp competences	The Erasmus+ funded project uses GreenComp as a strategic framework to the development of its learning materials designed for entrepreneurs. These include a business sustainability handbook and accompanying digital tools.	Adult learning	A Chamber of commerce, NGOs and private organisations	Denmark, Italy, Greece, Cyprus, Sweden and Bulgaria
EntreComp4Transition - Building upon the EntreComp Framework for a green and digital Transition	The project aims to combine EntreComp, DigComp and GreenComp in innovative learning materials along four learning paths to help develop entrepreneurial	Higher education, and VET	Public and private – international associations, NGOs, public bodies, chambers of commerce, HEIs and	An international association in addition to Austria, Belgium, Italy, Spain and Türkiye

	mindsets that support the green and digital transition		a business organisation	
Engineers4Europe	Three-year long Erasmus+ Alliances for Innovation project aims at operationalising the different EU competence frameworks (GreenComp, DigComp, LifeComp, EntreComp) for engineers.	Higher education	13 organisations	Eight countries, including the European remit on international associations involved
The Assessment of Sustainability Knowledge - TASK™	The online awareness test, TASK™ was developed for students and individuals who wish to assess their sustainability knowledge. To enhance a more structured take up of the test, a certification is being rolled out for HEIs.	Higher education, adult education	Private company - association	Belgium / international
Open Universiteit	Case study shows how the GreenComp Framework was adopted within an institutional setting. It was first adapted as a small-scale initiative at the Faculty of Management. Now GreenComp is being translated into all study programmes of the Open University	Higher education	Single HEI	The Netherlands
Greening the English classroom by making sustainability "visible"	Small scale bottom-up initiative of deploying GreenComp for specific training activities - one off event	Adult education	Public - authority	Regional, Italy
GreenSCENT – Smart Citizen Education for a Green Future	Horizon2020 research project that uses GreenComp as underpinning and integrates digital and green competences in the development of a competence framework	All levels	International consortium incl. HEIs, schools, private companies	International network

Education for Sustainable Development in the European School System	Multiple initiatives and activities focusing on embedding sustainability education in the European School System	School	Private – school	Belgium and other EU locations
NBS EduWorld - Developing learning scenarios	The case study focuses on the development of learning scenarios based on GreenComp by the project, led by the European Schoolnet	School	Public and private	International consortium covering 13 countries
Comparative case study				
Embedding GreenComp in national strategies and teacher training activities	Comparative case study on the national level initiatives to develop sustainable pedagogy in Finland and France	School	Public - authority	Finland and France

Source: Technopolis Group 2024.

The results of the desk-based research, stakeholder consultations and the analysis of the case study research are presented in the main body of this report while the individual case studies are appended. The database of identified projects and initiatives that use GreenComp is submitted as separate document.

2. Key findings

2.1 Overview of different sustainability competence development frameworks

Throughout the research carried out as part of this study, different viewpoints and preferences were expressed by the consulted stakeholders regarding existing competence frameworks, and GreenComp in particular. To better understand the context in which GreenComp was developed and more recent developments, the study team carried out desk-based research. This review resulted in the identification of concepts and frameworks addressing sustainability competences.

This chapter does not aim to provide a comprehensive overview of all available frameworks that address sustainability competences, but rather to showcase selected examples from different types of competence frameworks. Importantly, an overview of the most relevant frameworks in the literature on learning for the green transition and sustainability is included in the paper by Guia Bianchi (2020)[12] that fed into the development of the GreenComp Framework. It identifies a list of nine additional competence frameworks published between 2011 and 2021.

The competence frameworks reviewed as part of this study can be grouped together based on their content or target groups as follows:

- Frameworks focusing on sustainability competences only
- Frameworks linking sustainability and entrepreneurship-related competences
- Frameworks equipping teachers for sustainability education

Frameworks focusing on sustainability competences

The main frameworks focused on sustainability competences are outlined below, and *Figure 6* provides an overview of the different competences covered within each framework:

- In 2011, Wiek et al.[13] published their widely known and used framework "**Key competencies in sustainability: a reference framework for academic programme development**", which was based on an extensive literature review. The reference framework provides input to shaping academic programmes in sustainability at **undergraduate and graduate levels**. The framework lists five key competences: systems-thinking competence, anticipatory competence, normative competence, strategic competence, and interpersonal competence (see *Figure 6*).

- In 2020, Brundiers et al.[14] delivered a reference framework for key **competences in sustainability in higher education**. Carried out as a Delphi study with 14 international experts on sustainability education, this work builds on Wiek et al. (2011) adding two additional competences (see *Figure 6*). The framework provides

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guidance for sustainability programmes at universities, colleges, and it is aimed at equipping students with competences that address complex sustainability challenges.

▪ In 2021, Redman and Wiek[15] updated their 2011 framework by developing "**Competencies for Advancing Transformations Towards Sustainability"**. Based on extensive literature review, this research provides an update to the 2011 "Key Competencies in Sustainability" Framework. The unified framework centres on eight key competences in sustainability (five established and three emerging), and is complemented by discipline-specific, general, and other professional competences. The updated framework provides guidance to students, educators, and administrators of sustainability programmes in advancing transformations towards sustainability.

The key competences included in these frameworks are summarised in the chart below.

Figure 6 Visualisation of the competences included in the sustainability competence frameworks

Wiek, A. & Keeler, L. & Redman, C. (2011). Key Competencies in Sustainability: A Reference Framework for Academic Program Development.	Brundiers, et al. (2020). Key competencies in sustainability in higher education—toward an agreed-upon reference framework	Redman, A. & Wiek, A. (2021). Competencies for Advancing Transformations Towards Sustainability.
System Thinking		
Anticipatory / Futures Thinking		
Normative / Value Thinking		
Strategic (Thinking)		
Interpersonal (Collaborative)		
	Impletmentation	Impletmentation
Integrated Problem Solving*	Integrated Problem Solving	Integration
	Intrapersonal	Intrapersonal
Basic (Academic) Competences: critical thinking, communication, etc.		

*Source: Visualisation by Technopolis Group. | *Integrated Problem Solving was added to the framework from Wiek et al. in 2016. | For a detailed comparison, see Bianchi, G. (2020).*

Frameworks addressing sustainability entrepreneurship competences

▪ In 2014, Lans et al.[16] developed the first **sustainability entrepreneurship education** framework bridging the gap between education for sustainability and entrepreneurship. The target audience includes educators and students (higher education). The framework includes the following seven key competences that integrate entrepreneurial and sustainable competences: 1) Systems-thinking competence, 2) Embracing diversity and interdisciplinarity competence; 3) Foresighted thinking competence; 4) Normative competence; 5) Action competence; 6) Interpersonal competence; 7) Strategic management competence. The framework focuses on equipping students with the necessary competences to drive

[15] Redman, Aaron & Wiek, Arnim. (2021). Competencies for Advancing Transformations Towards Sustainability. Frontiers in Education. 6. 484. 10.3389/feduc.2021.785163

[16] Lans, Thomas & Blok, Vincent & Wesselink, Renate. (2014). Learning apart and together: Towards an integrated competence framework for sustainable entrepreneurship in higher education. Journal of Cleaner Production. 62. 37–47. 10.1016/j.jclepro.2013.03.036.

transformative change and address complex sustainability challenges in the context of entrepreneurship.

- In 2018, Ploum et al.[17] empirically **validated, tested and further developed** the existing framework from Lans et al. focusing on higher education students and would-be future **sustainability entrepreneurs**. The following six competences were adapted: 1) Strategic action competence, 2) Diversity competence, 3) System thinking competence, 4) Normative competence, 5) Foresighted thinking competence, 6) Interpersonal competence.

- In 2019, Biberhofer et al.[18] published a **Sustainable Entrepreneurial Education (SEE) framework** (in cooperation with practitioners with experience in implementing sustainability strategies) with five key competences: 1) Systemic competency; 2) Anticipatory competency; 3) Normative competency; 4) Strategic competence; and 5) Interpersonal competency. The framework prepares individuals to effectively address sustainability challenges in their entrepreneurial endeavours.

- Also in 2019, Foucrier and Wiek[19] developed a **process-oriented framework of competences for sustainability entrepreneurship**. The conceptual framework links sustainability competences to entrepreneurial processes. The outcome is a process-oriented and literature-based framework of sustainability entrepreneurship competences. The framework aims to equip higher education students with the necessary skills and knowledge to navigate the complexities of sustainability while creating and managing entrepreneurial ventures.

- In 2021, Diepolder et al.[20] published a **review of competence frameworks** aimed at facilitating **competence-oriented education for future sustainable entrepreneurs.** The review reveals that while these frameworks share overlapping content, there are notable differences in terms of their construction, validation, and complexity. The majority of the reviewed competence frameworks were developed for use in higher education institutions, underscoring the importance of extending their application to other educational levels. Regarding the competences included, the most commonly identified ones are critical thinking, making connections, community participation, and fostering a sense of collective responsibility. In contrast, certain fundamental competences such as emotional intelligence, futures literacy, and dealing with uncertainty receive less attention.

Frameworks and initiatives addressing educators' competences

- In 2012, UNECE developed a set of **educator competences for ESD**[21] with the support of an expert group. Designed as a framework for the professional development of educators, this tool seeks to facilitate the integration of ESD into all

[17] Ploum, L., Blok, V., Lans, T., & Omta, O. (2018). Toward a Validated Competence Framework for Sustainable Entrepreneurship. Organization & Environment, 31(2), 113-132. https://doi.org/10.1177/1086026617697039. Research built on framework developed by Lans et al. (2014). Lans T., Blok V., Wesselink R. (2014). Learning apart together: Towards an integrated framework for sustainable entrepreneurship competence in higher education. *Journal of Cleaner Production*, 62, 37-47.

[18] Biberhofer, Petra & Lintner, Claudia & Bernhardt, Johanna & Rieckmann, Marco. (2018). Facilitating work performance of sustainability-driven entrepreneurs through higher education: The relevance of competencies, values, worldviews and opportunities. International Journal of Entrepreneurship and Innovation. 20. 21-38. 10.1177/1465750318755881.

[19] Foucrier, Tamsin & Wiek, Arnim. (2019). A Process-Oriented Framework of Competencies for Sustainability Entrepreneurship. Sustainability. 11. 7250. 10.3390/su11247250. 10.3390/su11247250

[20] Diepolder, Charlotte & Weitzel, Holger & Huwer, Johannes. (2021). Competence Frameworks of Sustainable Entrepreneurship: A Systematic Review. Sustainability. 13. 13734. 10.3390/su132413734.

[21] UNECE (2012). Learning for the Future: Competences in Education for Sustainable Development; United Nations Economic Commission for Europe: Geneva, Switzerland. www.unece.org/fileadmin/.

educational programmes at all levels. It aims at ensuring that learners at different stages of their educational journey acquire the necessary knowledge, skills, and values to address sustainability challenges effectively.

- The Rounder Sense of Purpose project[22] funded by the Erasmus+ programme, used the UNECE framework as a basis when developing a more **practical framework of 12 competences**[23] for use in any educational context so that in-service and pre-service educators can develop and demonstrate their competence in ESD. The framework is for all educators, working at any level and encompasses social, economic, and environmental elements to foster a holistic understanding of purpose and responsibility in education.

- In 2020, Corres et al.[24] published a **systematic review of competence frameworks and models of sustainability competences for educators** in sustainability education. In their review they highlight the backgrounds of the analysed frameworks, the conceptual and pedagogical approaches towards sustainability and competences behind them, the different types of educators' competences included, and the pedagogical strategies applied to develop them.

- **Erasmus+ Teacher Academies[25]** are a flagship action of the current Erasmus+ program. These academies aim to create networks of communities of practice in teacher education. They offer courses, modules, and other learning opportunities on EU priorities such as digital pedagogical leadership, **sustainability**, equality, and inclusion. Their primary objectives include offering support for teachers at the beginning of their careers and strengthening their professional development. They also encourage multilingualism, language awareness, cultural diversity, and deep transnational cooperation between teacher training institutions.

- Between 2015 and 2021, the German Federal Institute for Vocational Education and Training (BIBB) carried out pilot projects in selected professional fields focusing on **integrating sustainability into vocational education and training**, as part of the funding priority 'Vocational Training for Sustainable Development (BBNE)'[26]. A follow-up project ('BBNE Transfer 2020-2022') focused on integrating sustainability competences in educator training.[27] In total, 12 pilot projects were implemented in the two funding lines that are of interest for this study in the sense that they developed a competence model for integrating sustainability into VET qualifications. The two funding lines refer to the development of domain-specific sustainability skills in trade professions and in food production and industry.

Further recent developments and projects

- A **taxonomy of skills for the green transition** has been integrated into the European Classification of Skills, Competences, Qualifications and Occupations (ESCO). The taxonomy has labelled 381 skills, 185 knowledge concepts and 5 transversal skills considered most relevant for a greener labour market. While not a

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[22] A Rounder Sense of Purpose (2024). Educating with a Rounder Sense of Purpose. https://aroundersenseofpurpose.eu/.

[23] A Rounder Sense of Purpose (2024). The 12 RSP Competences presented in a table. https://aroundersenseofpurpose.eu/framework/table/

[24] Corres, Andrea & Rieckmann, Marco & Espasa, Anna & Ruiz-Mallén, Isabel. (2020). Educator Competences in Sustainability Education: A Systematic Review of Frameworks. Sustainability. 12. 9858. 10.3390/su12239858.

[25] European Commission (2024). Erasmus+ Teacher Academies. https://education.ec.europa.eu/education-levels/school-education/erasmus-teacher-academies

[26] BIBB (2024). Modellversuche Berufsbildung für nachhaltige Entwicklung 2015-2019. www.bibb.de/de/42885.php.

[27] BIBB (2024). BBNE-Transfer 2020-2022. www.bibb.de/de/121439.php.

competence framework per se it is an important element of a European taxonomy of skills and competences.

▪ The **ECF4CLIM project**[28], funded under Horizon 2020, is developing a European Competence Framework (ECF) for transformational change through a multidisciplinary, transdisciplinary and participatory process. The objective of this work is to empower the educational community to take action against climate change and towards sustainable development.

▪ The **Inner Development Goals** (IDG) **Framework**[29] focuses on cultivating essential skills and qualities for sustainable living and productivity. Developed by international researchers, it identifies five dimensions—Being, Thinking, Relating, Collaborating, and Acting—comprising 23 competences related to inner growth and development. The framework's purpose is to empower individuals to live purposeful, sustainable lives, aligning with the Sustainable Development Goals. First published in 2021, the initiative emphasises co-creation, ongoing development, and input from experts, scientists, practitioners, and organizations worldwide. Its target audience includes anyone seeking personal growth and positive impact in a complex world.

▪ In 2021, Roland Berger - on behalf of the Flemish government Department of Work and Social Economy – developed a competence framework as part of a **Skills roadmap** for the **Flemish climate transition** focusing on energy-intensive industries[30]. That study identified, for the first time, the specific skills challenges facing the traditional energy-intensive industries (chemicals, petrochemicals, primary metals and rubber and plastics) in Flanders for the period 2020-2035.

There are a large number of other ongoing national and regional initiatives as well as international projects funded by Horizon Europe and Erasmus+ programmes that are addressing green skills and competence developments. Many of them use already developed frameworks, such as GreenComp or the UN ESD, while others set out to create new concepts and frameworks tailored to the projects' aims and objectives, target groups and local contexts. The main objective of this study is to showcase the use and adaptation of the GreenComp framework through selected examples, but as part of the case studies it also touches upon the use of some of the other frameworks mentioned above.

2.2 The use of GreenComp across different geographies and levels of education

The GreenComp framework is available as an online publication that can be downloaded by anyone. The study team collected information on 56 initiatives that are known to have used GreenComp in different ways. The information collected was captured in a mapping table with the objective to provide a structured basis for the selection of the case studies. In addition to this main purpose, this information also offers the opportunity to gain some basic insight of the initiatives and projects that use GreenComp in terms of:

▪ The level and type of education for which GreenComp is being used,

▪ The type of resources and funding used to implement the activities, and

▪ The geographical spread of the identified initiatives.

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[28] www.ecf4clim.net/
[29] https://innerdevelopmentgoals.org
[30] Roland Berger (2021). Skills roadmap voor de Vlaamse klimaattransitie. https://publicaties.vlaanderen.be/view-file/44786

Users haven taken up GreenComp in many different ways and forms, showing a large range of diversity in terms of scope and resource intensity. They vary from bottom-up initiatives driven by individuals through institutional approaches and projects implemented by international consortia to national level strategic initiatives. The table below provides an overview of the diversity of the initiatives and the sources of funding they use.

Figure 7 Types of the various initiatives identified

Type of initiative	Examples of activities implemented	Funding sources
Individual – bottom-up initiatives	▪ Preparation of a webinar or other awareness raising tools ▪ PhD thesis focusing on GreenComp and sustainability competences ▪ Teaching / training material development	▪ National / regional funding
Institutional approaches	▪ Teaching / training material development ▪ Development of assessment tools ▪ Research activities	▪ Private funding ▪ Institutional funding
International projects and initiatives	▪ Collection and dissemination of good practice examples ▪ Inclusion of sustainability competences in qualification frameworks ▪ Development of (online) assessment tools ▪ Development of training programmes, handbooks and learning materials ▪ Teacher training activities ▪ Update of curricula, enhancement of institutional practices focusing on sustainability ▪ Establishment of networks, community of practice ▪ Online and in-person training activities ▪ Competence framework development	▪ International associations ▪ Erasmus+ ▪ Horizon 2020 and Horizon Europe ▪ Other
Strategic, national level initiatives	▪ Teacher training activities ▪ Update of curricula	▪ National funding

Source: Technopolis Group 2024.

In terms of the level of education, most of the initiatives identified addressed school education (primary and secondary education). The overall distribution is as follows:

▪ Early childhood education and care   - 3 initiatives

▪ School education - primary and secondary   - 23 initiatives

▪ Vocational education and training - 7 initiatives

▪ Higher education – 13 initiatives

▪ Adult learning – 10 initiatives

The geographical concentration of the participating organisations shows a rather large diversity across the Member States. There are a few Members States where no use case of GreenComp was identified as part of this study, while in four Members States – Finland, Greece, Italy and Spain – there are a large number of various activities ongoing.

The map on the left-hand side shows the geographic concentration of the identified activities, with darker shading showing higher number of initiatives.

The subsequent chapters provide the key findings based-on the in-depth information collected for the case studies.

Figure 8 Geographical overview of the initiatives
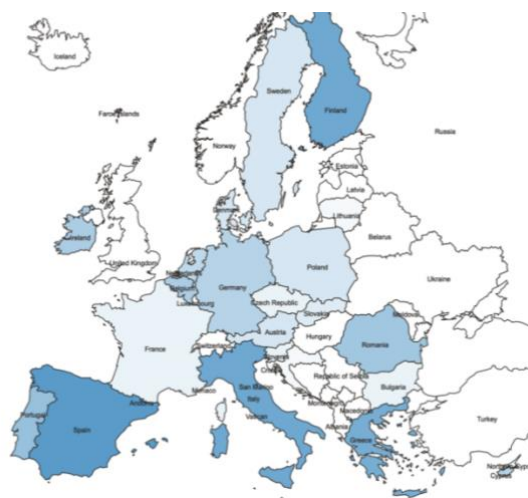
2.3 Motivations and expectations

The projects, initiatives and organisations analysed in this study had different reasons and motivations to use GreenComp. The main motivations can be summarised as follows:

- **GreenComp as a guidance document for education and training**: The GreenComp framework provides guidance for designing education and training programmes that foster sustainability competences. By applying and translating the framework, projects, initiatives, and organisations were able to ensure that their educational efforts align with recognised standards and best practices in sustainability education.

- **Alignment with global goals and EU policy agendas**: GreenComp is designed to align with global (sustainability) goals and policy agendas such as the United Nations Sustainable Development Goals (SDGs), the EU Skills Agenda. By adopting GreenComp, projects, initiatives, and organisations therefore demonstrate their commitment to contributing to these broader (sustainability) objectives and policy goals. This is especially relevant for those projects and initiatives that are applying for (international) funding and aim to demonstrate that they are in line with the policy agendas.

- **Networking and collaboration**: The adoption of a common competence framework such as GreenComp, can facilitate networking and collaboration among the partners of (international) projects and initiatives. The application of GreenComp therefore enables the stakeholders to share experiences, resources, and lessons learned, thereby enhancing collective impact and sustainability outcomes.

- **Recognition and accreditation:** GreenComp being a European competence framework is an indirect mechanism for recognition, accrediting individuals or organisations that apply the framework and demonstrate proficiency in sustainability competences.

While it is difficult to generalise from the very different projects and initiatives of this study, some expectations regarding GreenComp were:

- **Clarity and guidance:** Project partners expected GreenComp to provide clear guidance on the essential sustainability competences relevant to their context or sector. This includes a well-defined framework that outlines specific competences,

knowledge areas, and skills necessary for addressing sustainability challenges effectively.

▪ **Relevance and flexibility:** The projects partners, involved stakeholders expected GreenComp to be relevant and applicable to their specific goals, objectives, and target audience. They were searching for a framework that can be adapted to their various contexts and educational levels, ensuring its practical utility in their capacity-building efforts.

▪ **Measurable outcomes:** Some projects were looking for a tool or instrument that can help them aid developing the assessment of sustainability competences.

▪ **Integration with existing initiatives:** Some stakeholders had the expectations that GreenComp can be (seamlessly) integrated with existing (EU) initiatives, projects, or educational programmes. Projects or organisations look for alignment with other frameworks, standards, or methodologies they are already using, ensuring consistency and coherence in their efforts.

2.4 Types of activities and modes of implementation of using GreenComp

This chapter explores the different types of activities that were carried out by the initiatives focusing on GreenComp. Looking across the 12 case studies, the variation in the scale and scope of activities is significant, which was an intentional selection criterion to help showcase the diversity of possible interpretations and uses of the GreenComp framework.

All of the activities, regardless of the main objectives and desired outputs, started with establishing an **initial understanding of the content of the GreenComp framework** followed by an **assessment of its relevance, suitability and comprehensiveness** for the planned activities. The choice of embedding the various GreenComp competence areas and competences in the activities as well as the extent of such inclusion, however, varies initiative by initiative, and there is no one size fits all approach.

The case studies showcase a large variety of approaches and highlight other key sources of inspiration to advance sustainability competence development. Some of the projects **combined various competence frameworks for a holistic approach** reaching beyond sustainability competences:

▪ The EntreComp4Transition project applies a highly **comprehensive approach**, **combining three European competence frameworks -** DigComp, EntreComp and GreenComp – as part of innovative learning materials developed.

▪ The project **Engineers4Europe** decided that all four EU competence frameworks - DigComp, LifeComp, EntreComp and GreenComp – should be implemented in the context of the skills needs of the engineering profession. The frameworks are embedded in the Skills Council, the E4E Skills Strategy and Observatory for skills development that are being developed as part of the project as well as in the **innovative training for transversal competences and skills.**

▪ Other projects, such as **GreenComp Enterprises** explored DigComp and LifeComp and included specific aspects from them especially regarding the social aspects of LifeComp.

Other initiatives kept their **focus on sustainability competences** and even broadened the competences included in GreenComp by exploring **additional sustainability-focused competence frameworks** and **initiatives** to arrive to their desired outputs. An example is the work carried out by Sultiest on the TASK^{TM} sustainability knowledge assessment tool

that incorporates a wide range of sustainability-focused frameworks and concepts to arrive to a comprehensive assessment tool that entails 112 questions.

The case studies also showcase a **variety of the extent to which GreenComp competences** have been embedded in the projects.

▪ Projects that include **selected GreenComp competences** include the **EntreComp4 Transition** project. In the latter, the first learning path is dedicated to sustainability competences and reflects on a selection of competence areas from GreenComp that were identified based on a skill needs assessment with SMEs carried out by the project. The selected competences are depicted below.

Figure 9 EntreComp4Transition - Main competence areas needed by SMEs as identified from the three European competence frameworks
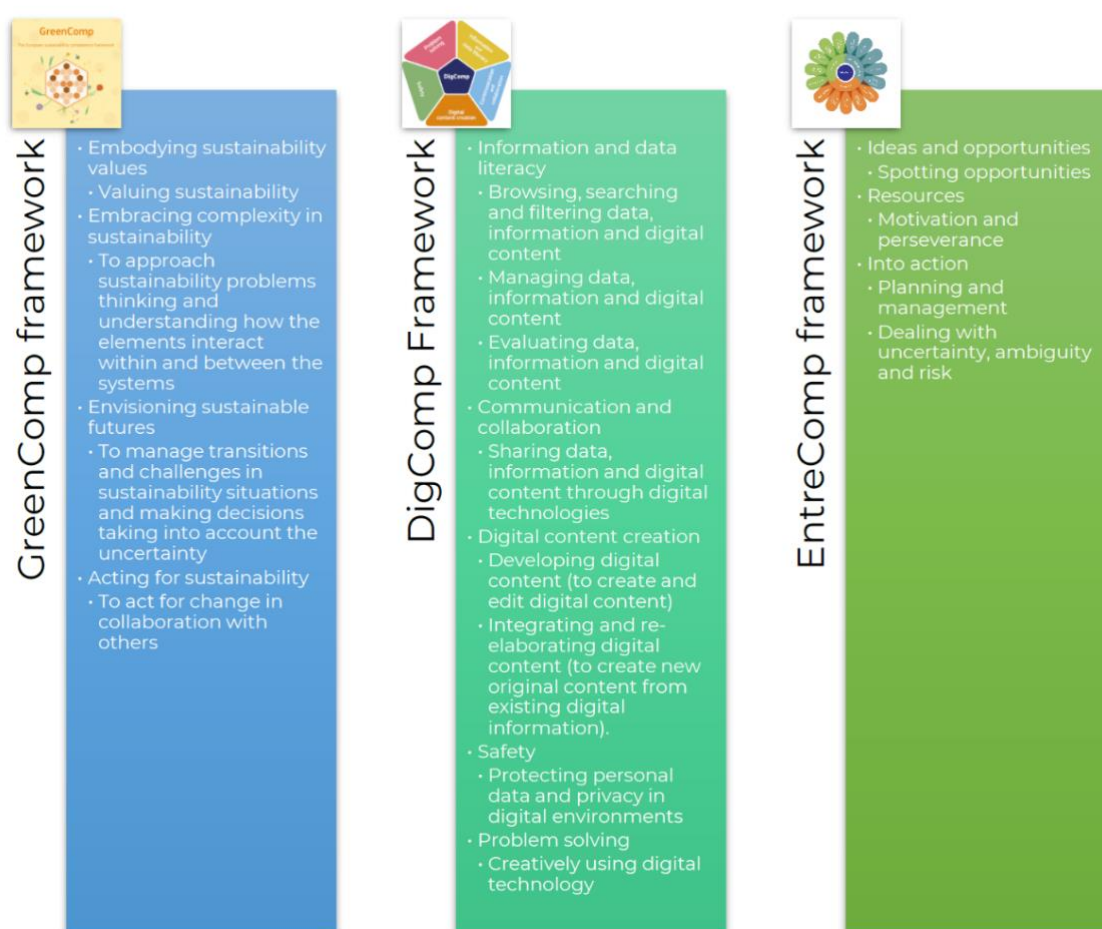
Source: EntreComp4Transition project: The future "Green Transition Facilitator" Learning path and methodology

▪ Other projects and initiatives embraced **all GreenComp competences** in their work. Examples include: **NBS EduWorld** where the initiative incorporated all GreenComp competences through the developed learning scenarios, the **DEED** project (see box below), or the **TAP-TS** self-assessment questionnaire, which is part of the project's Teacher Learning Programme element. It is aimed at enabling educators participating in the different events to self-assess their proficiency across the 12 GreenComp competences.

The key activity of the project is the development of a **green competence training programme**, **aligned with GreenComp**. It has been designed in a flexible format, in the form of micro-lessons, that allow VET teachers and trainers to pick and choose and incorporate them into their teaching. Micro-lessons are very small, 'bite-sized' and stand-alone pieces of trainings (some so small that they can be delivered within a few minutes' time). **For each of the 12 GreenComp competences,** approximately **15 key messages** were drafted. The key messages are directly linked to the knowledge, skills and attitudes included in the respective GreenComp competence statements. In total, approximately 200 micro-lessons will be developed based on an equal number of key messages derived from GreenComp.

Another way to look at how the initiatives embraced GreenComp in their activities is to explore the **extent to which the GreenComp competence areas and competences** are **explicitly included and recognised** in the outputs of the projects:

- Some of the projects while acknowledging the contribution and input of GreenComp to the design of the activities, do **not explicitly link the outputs to the GreenComp** competences. In the **GreenComp Enterprises project** the competence areas included in GreenComp were used during the initial phase of the project, when the partners discussed and decided about the content and chapters of the business sustainability handbook they developed.

- There are, however, initiatives, that **clearly reference the GreenComp competence areas**, such as the learning scenarios developed in **NBS EduWorld** or the **Learning and Teaching Packages of TAP-TS** (see box below), where ensuring that the competences are clearly articulated is an integral part of the outputs. This is naturally the case for the activities, which are aimed at developing competence-based education materials.

Box 2 Project example – TAP-TS

The materials of the **Learning & Teaching Packages** show the connection between learning and teaching activities and the competences, which are learning outcomes. This is an important bridge between quite abstract learning outcomes and practical classroom activities and resources. Accordingly, the LTPs contain a **description of the GreenComp competence areas and specific competences** addressed and should thereby help teachers understand and apply the competences in GreenComp.[31]

2.5 Key activities of the initiatives using GreenComp

In the following, we highlight different types of activities and related outputs generated by the different initiatives and projects of the 12 case studies. We will lay out different examples of the activity types along the different levels of education covered by the case studies.

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[31] While the project is currently finalising the LTPs, a first broad analysis of the GreenComp coverage has shown that the LTPs currently focus on competences such as valuing sustainability, system thinking and critical thinking while political agency, resilience and adaptability are less covered. This emphasis is partly attributed to the focus on primary school and the inherent complexities in addressing aspects like political agency at this level.

Figure 10 Overview of types of activities identified and education levels covered

Type of activity	School education	VET	Higher education	Adult learning
Collection and dissemination of good practice examples			🎓	💼
Inclusion of sustainability competences in qualification frameworks				💼
Development of (online) assessment tools	📖	⚙️	🎓	
Development of training programmes, handbooks and learning materials	📖	⚙️		💼
Teacher training activities	📖	⚙️		
Updating curricula	📖		🎓	
Establishment of networks and communities of practice		⚙️	🎓	💼
Online and in-person training				💼
Development of a national competence framework	📖			

Source: Technopolis Group 2024.

Collection and dissemination of good practice examples

The collection and dissemination of good practice examples aim to enhance the integration of the GreenComp framework into various educational contexts. Targeted activities can foster widespread adoption and effective utilisation of the GreenComp framework across diverse educational settings. In higher education, for instance, the Open University has developed and disseminated effective **(good) practices** for adapting and implementing the GreenComp framework within university curricula, providing students with comprehensive sustainability education. Similarly, in adult learning, **webinars** designed to introduce and explore the GreenComp framework offer professionals opportunities to enhance their understanding and application of sustainability competences in their respective fields, serves as an example (Case Study: Greening the English classroom).

Inclusion of sustainability competences in qualification frameworks

Another activity is the inclusion of sustainability competences in qualification frameworks and the creation of badges. In adult education, notable efforts include **developing training programmes focused on transversal competences and skills**, delivered as micro-credentials. These micro-credentials provide learners with tangible recognition of their proficiency in sustainability-related skills, complemented by an **E4E Skills Passport** documenting individual competences and achievements in sustainability.

Development of (online) assessment tools

The development of (online) assessment tools is prevalent across educational levels. These tools equip educators and learners with resources to evaluate and enhance their sustainability competences. Concrete examples include:

- In school education, educators use a comprehensive **survey to self-assess their proficiency across the 12 GreenComp competences** (Case Study: TAP-TS).

- In VET, learners utilise a **skills self-assessment tool** to evaluate their proficiency in sustainability-related skills, supporting personalised learning experiences (Case Study: EntreComp4Transition).

- In higher education, an **online questionnaire** assesses students' sustainability knowledge, providing formal recognition (certificate) of their proficiency (Case Study: TASK^{TM}).

Development of training programmes, handbooks and learning materials

Through the development of learning materials, educators and learners receive valuable resources to promote sustainability and drive positive change across different educational levels:

- In school education, Learning & Teaching Packages are created, comprising **open resource online courses** (Case Study: TAP-TS). **MOOCs** under the title "Exploring Nature-Based Solutions in Your Classroom" (Case Study: NBS EduWorld) provide educators with comprehensive training on incorporating sustainability concepts into teaching practices, fostering environmental awareness among students.

- In VET, a **green competence training programme** delivers **micro-lessons**, in a dual-blended format, enhancing learners' employability environmentally conscious industries. (Case Study: DEED project).

- For adult learners, a **business sustainability handbook and accompanying MOOCs** provide practical guidance and training on implementing sustainable practices within organizational settings (Case Study: GreenComp Enterprises).

Teacher training activities

Tailored training activities for educators in both school education and VET empower them with the necessary knowledge and skills to effectively educate students about sustainability:

- In school education, a comprehensive **Teacher Learning Programme** offers diverse training modalities for continuous professional development, enabling educators to explore innovative pedagogical approaches and integrate sustainability concepts into their curriculum. (Case Study: TAP-TS).

- In VET, a **teachers' guide on green competence training** provides practical guidance on incorporating sustainability-related content into teaching methodologies (Case Study: DEED).

Updating curricula

Updating curricula is essential to ensure educational programmes remain relevant and responsive to evolving needs, especially in sustainability education. Through the following activities, both school and higher education institutions play a crucial role in preparing students to address challenges of sustainability.

- In school education, the focus is on **developing learning scenarios** that integrate sustainability concepts across various subjects (Case Study: NBS EduWorld). These scenarios provide educators with structured frameworks for designing interdisciplinary lessons and incorporating real-world sustainability issues into the curriculum.

- In higher education, an **interactive 'curriculum scan'** assess and updates existing curricula to include sustainability-related content, enabling academic institutions to identify gaps in the curriculum and integrate sustainability principles into course offerings (Case Study: Open University).

Establishment of networks and communities of practice

In VET, **a virtual space** serves as a hub for VET professionals to exchange knowledge, best practices, and innovative approaches related to sustainability education and training (Case Study: GreenComp Enterprises). By facilitating communication and

collaboration, this activity promotes continuous learning, networking, and the dissemination of strategies for integrating sustainability into vocational training programs.

| **Online and in-person training** | In the realm of adult learning, **online and in-person training** is tailored to meet the needs of entrepreneurs seeking to enhance their sustainability competences. |

| **Development of a national competence framework** | A significant activity in school education is the development of a national **Education for Sustainable Development (ESD) competence framework in France** inspired by GreenComp. This framework guides educators and policymakers in promoting |

sustainability competences. Through collaborative efforts involving experts in education and sustainability, the development of this framework ensures alignment with national educational objectives and priorities, thereby facilitating the systematic integration of sustainability education into the curriculum.

2.6 Enabling factors, challenges and transferability

This chapter focuses on the 12 case studies and analyses the differences and similarities in the take-up of the framework with regard to enabling factors, context and challenges across the different cases. Subsequently, aspects of transferability are highlighted across the cases.

Enabling factors

Eight out of twelve cases studies highlight that the GreenComp framework provides a **"common language" and an overall reference point** for sustainability competences. For DEED, TAP-TS and GreenComp Enterprises, the focus lies in the GreenComp giving the users a shared understanding. Similarly, in the EntreComp4Transition case study it is highlighted that the framework gives a general contextualisation and in Engineers 4 Europe GreenComp is described as a bridge, facilitating collaboration and discussion. In NBS EduWorld, GreenComp was deliberately chosen due to the framework giving "adaptable guidance". In essence, these diverse perspectives converge on the framework's role as a **guiding model** in the context of sustainability competences.

Another enabling factor, viewed through the spectrum of the case studies, is that GreenComp is a **versatile and adaptable instrument**. The DEED project perceives GreenComp as an open and intuitive tool, fostering accessibility and ease of use. The TAP-TS project highlights the participatory element of the framework, together with a bottom-up and collective engagement approach. In Engineers4Europe the holistic nature and yet adoptability (with reference to skills and competence development) of GreenComp are emphasised. Similarly, TASK™ underscores that the framework has to be treated as a guide, allowing flexibility in interpretation and application. In essence, GreenComp being understood as an **adaptable guide**, steering diverse stakeholders toward sustainability competences with **flexibility and purpose**, is seen as a facilitating factor for many of the case studies.

Across the various case studies, the importance of the **expertise and mindset of the involved** team and experts working with GreenComp were highlighted as critical factors. In TAP-TS the need to engage individuals possessing the "right and open mindset" fostering receptivity, adaptability, and a willingness to explore new perspectives was emphasised. Similarly, in the **EntreComp4Transition** case study, expertise and a deep understanding of and experience with (European) competence frameworks play a pivotal role. Moreover, in the institutional case of the Open University the significance of the academic background and experience in sustainability within institutional contexts of the leading researchers is underscored. In essence, the **interplay of mindset, expertise,**

and specialised leadership contributes to the success of applying the GreenComp framework.

Challenges

The **challenge of translating and applying GreenComp to diverse educational levels** resonates across the case studies. DEED grapples with this issue, particularly in the context of Vocational Education and Training (VET). Similarly, TAP-TS and GreenComp Enterprises navigates the complexities of adapting GreenComp to varying educational tiers. Notably, the Greening the English Classroom case study successfully demonstrates that the framework can be tailored to specialised contexts, such as language teaching. The NBS case study notes that it takes significant resources to adapt the framework to educators and teachers and ensure relevance in the diverse contexts. In essence, the challenge of translating and applying GreenComp to diverse educational levels underscores the need for adaptable solutions.

Another common challenge refers to ensuring **adaptability to different national, regional and institutional contexts**. For instance, for TAP-TS coherence across all national and regional contexts as well as institutions has been a major challenge. GreenComp Enterprises emphasised that the application of GreenComp needs to take into account the respective national contexts, as the framework conditions are very different.

Finally, the **resource intensity in terms of time requirements for understanding and applying GreenComp** has been highlighted in most of the case studies. While the framework proved to be an invaluable guide for most projects and initiatives, it required substantial time investment to gain a comprehensive understanding of it (e.g. GreenComp Enterprises).

In addition, some individual facilitating factors and challenges have emerged as interesting and relevant:

▪ The Engineers4Europe project benefits from the **solid academic foundation** of GreenComp, which serves as a crucial factor for all partners, especially education providers, professional bodies, and national entities involved.

▪ The French and Finnish case study emphasises as enabling factors the **political attention on sustainability**, which aids in the adaptation and integration of GreenComp within their respective contexts.

▪ The TAP-TS project encounters the challenge of **scepticism towards adopting new educational practices**, hindering the acceptance and implementation of GreenComp.

▪ TASK^TM faces challenges due to the framework's **lack of testing in a real setting** and its **incompleteness in certain competences** such as responsible production and consumption, circular economy competences, or those specific to certain educational contexts.

Transferability

Different elements of **transferability to other education and training settings of the evidence gathered by the presented case studies** is underscored in many of them:

▪ Multiple case studies underscore the **potential of best practices** in translating GreenComp into reality and aligning it with learning goals to enhance the framework's applicability across diverse contexts. A publication of best practices would allow GreenComp readers to understand the different ways the framework can be used / applied.

- DEED showcases a **transferable process** where the framework was analysed and operationalised for individual purposes, facilitating the development of tailored learning materials.

- TAP-TS demonstrates the **collaborative effort in unifying different actors and approaches**, emphasizing the framework's applicability for different stakeholders.

- Engineers4Europe's **methodology is noted for its flexibility and adaptability across countries**, with built-in monitoring mechanisms ensuring sustainable competence development beyond project lifecycles.

- The Open University's multidisciplinary approach further explores **how GreenComp can best serve different disciplines and whole institutions**.

- GreenSCENT provides accessible **tools and resources**, such as green storytelling for children, enhancing community engagement.

2.7 Lessons learnt

The previous chapter has already highlighted some elements regarding transferability that touched upon the lessons learnt collected from the case studies. In addition to the previous reflections, the following key lessons are emerging across the case studies:

- There is a broad consensus among the stakeholders consulted for this study that **sustainability competence** should be understood as a **transdisciplinary competence.** The inclusion of **social, economic and cultural aspects** next to the environmental focus within the framework and the multidimensionality of it are positively regarded.

- GreenComp is regarded as a **helpful and accessible framework** with which to work. The four competence areas are perceived as **clear and intuitive** and supporting a holistic learning process. The framework should be **perceived and treated as a guide** and adapted respectively.

- The framework helps develop a **shared understanding** among individuals and institutions coming from different national and educational contexts. It offers value by being a generic **framework validated at European level**, as this generates discussion among partners while providing a solid basis and common point of departure.

- GreenComp works well if it is embraced as a **participatory framework** adaptable to the unique needs and dynamics of each stakeholder and context. If used as a **bottom-up approach** it created room for experimentation and idea generation.

- Although it may sound obvious, but there is a need to **properly understand the GreenComp framework** before being able to work with it. While the framework is easy to read and understand at an initial level according to most interviewees, full comprehension requires deeper engagement, which can be **resource intensive and time consuming**.

- Ensuring **tailoring, contextualisation, and retaining transversality** are vital aspects for any competence framework. Even if the needs and challenges show similarities, the framework conditions that affect implementation are usually very different. Some of the projects tackled this by **engaging experts** who were highly experienced with competence frameworks and their application in learning design, while others elucidated the GreenComp framework with a **simplified presentation** – webinar or video - of a straightforward structure with clear visualisations to

effectively convey the essence of GreenComp to teachers and educators, enabling them to utilise the GreenComp principles.

- The framework has a great **potential to support various sustainability education and training-related purposes** as showcased by the numerous objectives targeted by the projects using GreenComp as described in the case studies. However, it is a novel framework, which is **not widely known as yet**. Further evidence on its use in various contexts and a larger 'user community' will help its wider take-up in the future.

- The topic of **sustainability**, and its **scale and scope** are **continuously evolving**. In line with these changes, it is expected that GreenComp might go through revisions to maintain its relevance and broaden its scope. Emerging themes that might need further reflections in the sustainability competence framework include competences needed for the circular economy or distinctions made for specific education levels.

European Commission

3. Recommendations for future developments and adaptation of the GreenComp framework

Recommendation 1: Support the translation of GreenComp into (practical) application

Reflections:

- The GreenComp framework was designed as a guiding document that needs adaptation and contextualisation.

- Many stakeholders recognise the utility of the GreenComp framework and find it easy to read and understand, but there is a notable challenge in putting the framework into practice. Some stakeholders, particularly non-expert users, acknowledge a sense of familiarity with GreenComp, but express limitations in their capacity to effectively apply it. Translating the competences into the realities of classrooms, training programmes and curricula is a challenging task.

- There are, however, emerging examples of initiatives and projects that have embraced the framework and showcased its application in various contexts targeting different stakeholder groups and pursuing various objectives, as showcased by the case studies in the study.

- European funding sources, including programmes like Erasmus+ and Horizon 2020, have offered funding opportunities for projects aimed at enhancing green skills and competence-based education. Many of these projects have specifically used GreenComp.

Action Points

➔ Encourage the practical application of the GreenComp framework by providing **comprehensive guidance on how it can be used in different contexts**. This includes creating **user-friendly manuals, toolkits, and/or instructional materials** that outline different approaches for integrating GreenComp into various educational settings. The guidance materials – or 'how to' guides - should distinguish targeting various stakeholder groups and thereby have varying level of information in their content:

  o **Target group: Those not yet engaged with GreenComp - general, high-level information** on GreenComp in the format of a short presentation, with the background, content and potential uses and key sources of information, the address of the CoP and a Helpdesk.

  o **Target group: Those interested in GreenComp and yet to start engaging with the competence framework – structured information addressing different purposes, activity types and levels of education** (as included in Figure 7 and Figure 10 of this report). For example: How to include GreenComp in the development of training materials for adult education? How to translate GreenComp to be used in a classroom in primary education? For these guides, setting out the objectives of the use of GreenComp, key steps to follow, challenges to consider and stakeholders to consult could facilitate the interpretation of the competence framework. Such manuals could be exemplified by the examples showcased in these case studies developed for this study.

  o **Target group: Those already using GreenComp and needing further support - templates** e.g. support to capturing competence development, seeking feedback from different target groups and **toolkits** e.g. a

> GreenComp canvas that helps prioritise the competence areas one wishes to focus on short, medium and longer terms

➔ Consider organising **training events / information sessions** for examples webinars, MOOCs and if possible, in-person training events as well to showcase how GreenComp can be translated into practical use in a variety of contexts. To facilitate the practical application of GreenComp, it is essential to **share instructional materials** and **resources** (see first Action Point) **widely within the education community**. This can be done via a dedicated online platform and repository, as part of workshops, webinars and training sessions, through the engagement of peer networks and communities of practice or in the form of publications i.e. articles, case studies and reports showcasing successful implementation models.

Recommendation 2: Enhance Dissemination Efforts

Reflections:

- In July 2023 GreenComp was by far the "most downloaded JRC report," attesting to its resonance within education stakeholders and the general public. Active dissemination efforts were undertaken, leveraging the engagement of experts and stakeholders who participated in the design of the framework.

- However, many of the case study interviewees highlighted that they were not familiar with the GreenComp framework before embarking on their project activities. This is due to the recent publication of the framework but also to the challenge of generating a significant outreach when the target audience is vast.

- Interview partners described the reception of the GreenComp framework as very positive and generating unexpected enthusiasm among a wide range of stakeholder groups.

- The GreenComp framework is translated into all EU languages, which helps enhancing its reach and impact. The case study interviews highlighted that the framework is used in many EU languages – especially when engaging local and national stakeholders e.g. schoolteachers, SME representatives - although English is still the most used.

Action Points

➔ Recognise the potential for further awareness raising and understanding of the GreenComp framework and **prioritise ongoing dissemination efforts**.

➔ Develop a **targeted communication** strategy including stakeholder mapping and **outreach activities** aimed at raising awareness about GreenComp among key stakeholders. These activities should facilitate both the **top-down** and **bottom-up take-up of GreenComp**. By combining bottom-up initiatives with top-down support, the uptake of GreenComp can be accelerated, leading to wider adoption and impact across Europe.

   o **Collaborate with national and regional authorities, educational networks, international associations and networks and other partners** who can act as multipliers and support the take up of GreenComp more strategically and amplify dissemination efforts and reach diverse audiences across Europe.

   o Invest in **continued dissemination activities** to ensure that GreenComp becomes a well-known and widely utilised resource in the field of sustainability education. By increasing visibility and accessibility, creating synergies with relevant activities and showcasing use cases, more stakeholders will be

encouraged to engage with the framework, leading to its broader adoption and impact in promoting sustainability competences.

o Utilise **various channels** such as websites, social media platforms, newsletters, conferences, and workshops to disseminate information about the framework's purpose, benefits, and practical applications to a broad target audience.

Recommendation 3: Support the (further) uptake through use cases, good practices, and the Communities of Practice

Reflections:

▪ While it is not feasible to comprehensively map the take-up of GreenComp across countries and education levels, this study provides insight into the variety of its use.

▪ The impact of the various activities showcased in the case studies in this report cannot be seen as most of them are still ongoing, but there are projects and initiatives such as Engineers4Europe, the development of learning scenarios and the French and Finnish national level examples that have the potential to generate wider impact due to the direct involvement of key stakeholders and the resources made available by them e.g. ministries and European level associations and professional bodies.

▪ The GreenComp Community of Practice is a collaborative space where individuals and organisations come together to engage in various activities, including discussions, learning experiences, and practical applications of the GreenComp framework. The CoP serves as an initial support mechanism to guide users in utilising the framework and fostering a stronger uptake. This collaborative community approach is seen as useful in enhancing the practical application of the framework.

Action Points

➔ Facilitate the uptake of GreenComp by **providing tangible use cases, exemplary practices, and success stories** from various educational settings. Continue to showcase how the framework has been effectively implemented to enhance sustainability competences among learners and educators.

➔ **Bring together stakeholder**s from the education communities (e.g. Teacher Academies) that are developing training programmes and capacity-building initiatives aimed at enhancing educators' understanding and proficiency in using the framework effectively to help them share experiences.

➔ **Continue and foster the GreenComp Community of Practice** for stakeholders and **create synergies** with other CoPs for an enhanced outreach. Sharing experiences, exchanging knowledge, and collaborating on new/innovative approaches that integrate GreenComp into educational policies and practices are needed to generate buy-in and enhance the take-up of GreenComp.

Recommendation 4: Maintain the 'Living Document Nature'

Reflections:

▪ A feature of the GreenComp framework noted and valued by all stakeholders is the conceptualisation of it as a "living document." This designation implies a dynamic and adaptable nature, allowing for flexible adaptation in diverse contexts. This adaptability underscores the framework's commitment to responsiveness and relevance, ensuring its continued utility amid evolving educational landscapes and sustainability imperatives.

- There is a collective sentiment among stakeholders that GreenComp should be kept up to date, while also recognising the potential for further expansion. The case studies showed diversity of uses of GreenComp in combination of other competence frameworks and initiatives, which signals opportunities for potential future enhancements. All of these initiatives are in development or in early phases, therefore feedback on their implementation is not yet available.

Action Points

➔ Ensure that the GreenComp framework **remains dynamic and responsive to evolving needs** by maintaining its status as a "living document".

➔ Regularly **revisit and update the framework** to incorporate the latest research findings, best practices, and lessons learned from ongoing projects and initiatives.

➔ **Utilise feedback mechanisms and consultation processes** to gather input from stakeholders, including educators, policymakers, and experts in sustainability education. By **continuously refining and improving the framework**, its relevance and applicability can be sustained over time.

Compendium of case studies

Digital Environmental Education in VET (DEED)
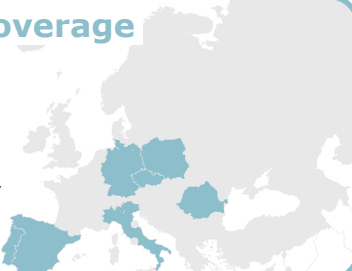
Deed Digital Environmental Education in VET

Geographic coverage

Czech Republic, Germany, Italy, Poland, Portugal, Romania, Spain

Type of initiative

Erasmus+
Cooperation Partnership

E+

Timeline

December **2022**   November **2024**

Education level

Vocational education and training (VET)

Keywords

Green competences in vocational education and training, digital tools

1 Overview of the case study

The Digital Environmental Education in VET project (DEED) is a two-year (12/2022 – 11/2024) project funded under Erasmus+ Key Action 2 (Cooperation partnerships in vocational education and training).[1] The key objective of the project is to promote the **development of green competences in vocational education and training (VET)** through the innovative use of **digital tools** (personal mobile devices).

Objectives

More specifically, the DEED project has the following aims:

- To create and contribute to a **professional network** in the field of environmental education,
- To develop **multimedia training content** that supports the development of learners' green competences,
- To provide capacity building to VET teachers and trainers including **guidance** on how to promote the development of green competences in their courses and lessons,
- To **disseminate the results** of the project within the professional networks of the partners.

The project acronym, 'DEED', is to be understood as doing a good deed by fighting against climate change. Project partners seek to **address the lack of available educational materials** and sources for VET teachers and trainers to effectively address the topic of climate change and environmental protection.

The **key target groups** of the project are VET teachers and trainers, as well as school leaders. The participating VET schools and centres established that many of their teachers and trainers seemed to have very limited knowledge related to climate change and environmental protection. They therefore wanted to start a project to address this gap and provide a set of easily accessible, attractive tools to VET teachers and trainers in various disciplines. Another target group are VET learners as the

Target groups

1   Project reference: 2022-1-CZ01-KA220-VET-000088190, https://erasmus-plus.ec.europa.eu/projects/search/details/2022-1-CZ01-KA220-VET-000088190

micro-lessons are aimed at them.

The DEED partnership consists of seven project partners from seven different EU countries:

- The project is coordinated by **ProEduca z.s.**, a private association of professional teachers based in Czechia. Their key focus is on innovation in education, and on providing supporting services – mainly in the form of trainings to education staff and youth – to schools and non-profit organisations active in education.

- **Archivio della Memoria**[2] is a cultural association based in Rome, Italy. They specialise in social, historical, anthropological and market research and in creating highly innovative multimedia support material on behalf of universities, public bodies and private organisations

- The **Association for Enhancing Educational Initiatives ASIE**[3] is a Romania-based umbrella association of teachers, trainers, coaches and other professionals involved in education. They develop a wide range of educational activities aiming to promote, enhance and develop the link between wide educational entities (such as schools, training centres, counselling centres), local community and relevant companies.

- **Atlântica University Institute**[4] is a higher education institution located in Barcarena, Oeiras, Portugal. They offer higher education qualifications in various different fields, with a strong professional orientation and with close links to the labour market.

- **LernBar Europa e.V.**[5], is a non-profit association dedicated to promoting a common European understanding through network building and mutual exchange.

- **Centro Superior de Formación Europa Sur (CESUR)**[6] is a Spanish, private vocational education and training centre. Their network of 22 VET centres is spread across the largest cities of the country, offering various types of VET qualifications ranging from EQF levels 1-5.

- **Danmar Computers**[7] is a private company operating in the field of information technology and providing vocational training in this field. They possess extensive experience in developing modern web and mobile applications for educational purposes.

The project will generate the following **deliverables**[8]:

- A **virtual library** providing key information and sources related to the topic,

- A **green competence training programme** consisting of 200+ micro-lessons aligned with GreenComp and complemented by assessment criteria,

- A **teachers' guide** on green competence training,

- A **green competence training** platform.

At the time of writing this case study, all project deliverables are still work in progress and have not been made available yet. The partnership will also test the developed micro-lessons and materials with their students. Testing is planned to take place in the course of 2024 with VET schools in Czechia, Portugal, Romania and Spain.

The key **expected impact** is to actively bring VET teachers and trainers to incorporate environmental and climate-change content into their classes – across various disciplines and equip them with a set of tools that makes it easy and attractive to do so.

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2   https://www.archiviodellamemoria.it/
3   https://asieong.wordpress.com/
4   https://www.uatlantica.pt/
5   https://lernbar-europa.eu
6   https://www.linkedin.com/school/cesurformacion/
7   https://danmar-computers.com.pl/en/
8   With the project at mid-point of its implementation at the time of writing this case study, no finalised deliverables have been published/made available yet.

2   The use of GreenComp

The decision to use GreenComp was described as a rather pragmatic one. Following online research by the project coordinator, GreenComp appeared to be the **most prominent framework** available for the purposes of the DEED project. The fact that it was **developed at EU level and developed with a solid scientific foundation** gave the partnership the reassurance that they would be basing their work on a credible and trusted tool.

Several of the project partners had not been aware of GreenComp prior to the start of the project. Although the project partners did not actively consider the use of any alternative framework, they are confident that the decision to use GreenComp has been the right one for their project. Even today they have not found any other tool as comprehensive and well-structured as GreenComp, making it fit for purpose for the use in the DEED project. So far, no weaknesses of the framework could be identified.

The key activity of the project is the development of a **green competence training programme**, aligned with **GreenComp**. It is currently being developed and has been designed in a flexible format, in the form of micro-lessons, that allow VET teachers and trainers to pick and choose and incorporate them into their teaching.

Micro-lessons are very small, 'bite-sized' and stand-alone pieces of training (some so small that they can be delivered within a few minutes' time). As a first step, for each of the 12 GreenComp competences, approximately **15 key messages** were drafted, directly linked to the knowledge, skills and attitudes included in the respective GreenComp competence statements. **For each key message a micro-lesson** is being developed. I.e., each key message can be understood as the title of one micro-lesson. Each key message should be formulated in a way that is easily understood by learners. In total, approximately 200 micro-lessons will be developed based on an equal number of key messages derived from GreenComp. At the time of writing this case study, approximately 30 out of the 200+ micro-lessons had already been developed and were undergoing peer review within the consortium.

Box 2   Example for key messages based on GreenComp competence

For the *GreenComp competence **"Valuing sustainability", t**wo* **key messages** were developed:[9]

- *Choosing sustainable products and services can help create a demand for more sustainable options in the market*

- *Environmental degradation and climate change disproportionately affect vulnerable populations*

All partners contribute to developing the micro-lessons, although ProEduca and ASIE are the two key partners involved in applying GreenComp. The key task in developing the micro-lessons is to operationalise the framework, i.e., how a certain competence (or elements thereof) can be developed through innovative and hands-on teaching. For most micro-lessons, **multimedia material** will be developed (i.e. mainly short videos or infographics via Canva).[10] At a later stage of the project, the micro-lessons will be complemented by **assessment criteria** – also aligned with GreenComp. GreenComp will also be applied for the development of the **teachers' guide** on how to use the micro-lessons as part of their teaching. It will provide guidance for teachers on how to use the micro-lessons as part of their teaching. The future guide, written by ASIE, will also point to the cross-cutting relevance of green competence across various disciplines and will be illustrated using GreenComp.

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9   Please note that these are draft key messages; they might still be edited following peer review and testing of the micro-lessons.

10   One pending issue that is currently being discussed within the partnership refers to whether the material should be editable, e.g. so that users can translate the (video) content into other languages.

3 The context - enabling conditions and challenges

The interviewed project partners noted that it took them some time to **understand the GreenComp conceptualisation** and **structure to agree on how to best use it** for the design of the green competence micro-lessons, and to be able to apply it in the context of vocational education and training. Especially to those partners that had not been aware of GreenComp before, the material seemed a bit **complex** at first and required more than one read-through. However, in the end there was agreement among partners that GreenComp did indeed serve as a good basis for the development of the micro-lessons.

The project partners only had the GreenComp document available (with no further guidance or support) and considered this sufficient. **Appendix 2** (including the knowledge, skills and attitude statements for each competence) was highlighted as **particularly helpful** for the development of the micro-lessons, and described as maybe the most useful element of the entire framework. Concepts that appeared complex when first studying the model became much clearer through the additional information provided in this annex. Asked whether they would have requested more guidance on using the framework, the interviewed project partners stated that the document could stand on its own and would not necessarily need to be accompanied by additional guidance, at least not for their specific application in the DEED project.

4 Leasons learnt and recommendations

The interviewed project partners emphasised that green competence should be understood as a **transdisciplinary competence** and be applied by teachers and trainers independent of their discipline. They considered GreenComp as an **open and intuitive tool** that could be introduced to teachers and trainers on a much larger scale. The interviewed project partners saw great **potential in the use of GreenComp for various education and training purposes** – provided that its existence were more widely promoted and communicated in the future.

DEED has the potential to become an example of good practice in implementing the GreenComp framework. The process described by the interviewed partners on how they analysed the framework and developed a method to operationalise it for their own purpose, i.e., the development of bite-sized pieces of learning, seems well-developed. However, it is at this stage difficult to make any further judgment, with the project at its mid-point of implementation and with none of the project deliverables formally finalised or published. The final list of key messages (i.e., titles of the micro-lessons derived from the GreenComp statements) and the actual content developed will eventually contribute to an informed judgement.

TAP-TS

Developing sustainability competences among teachers, student teachers, and teacher educators

Teacher Academy Project
TEACHING SUSTAINABILITY

Geographic coverage

Austria, Belgium, Cyprus, Germany, Ireland, Portugal, Sweden

Type of initiative

Erasmus+
Teacher Academy

Timeline

2022   2025

Education level

School education

Keywords

teacher learning programme, open resource online cours-es, sustainability education competences
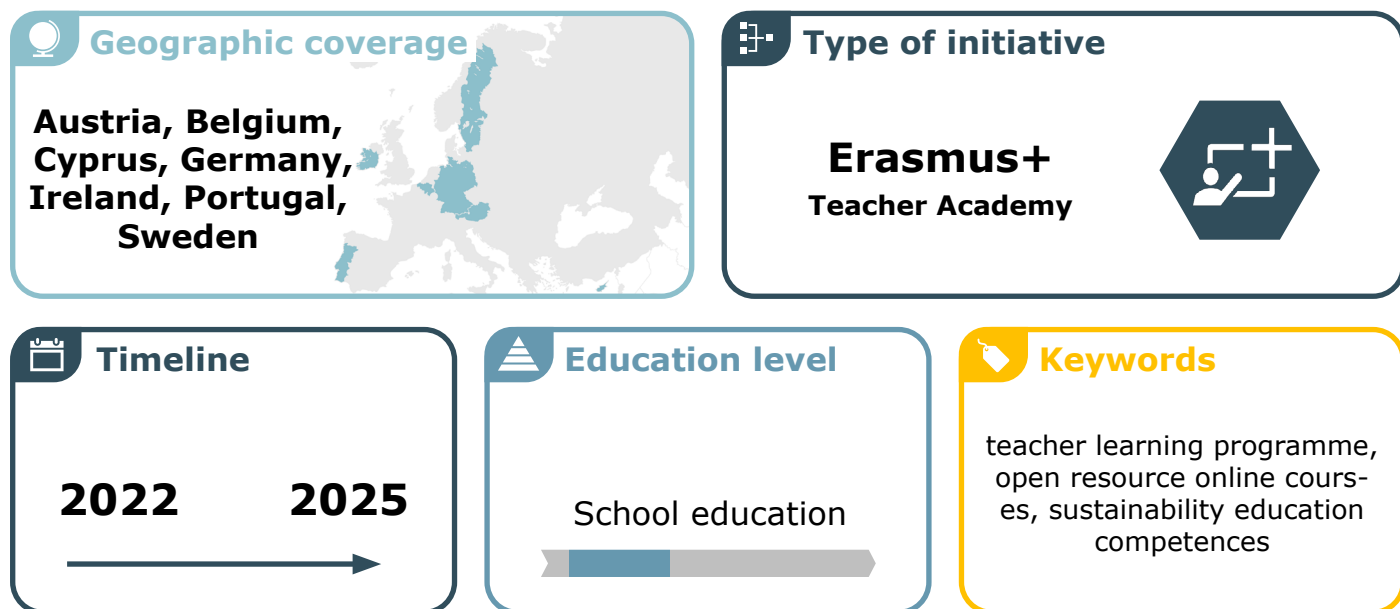
1 Overview of the case study

TAP-TS is an **Erasmus+ Teacher Academy**[1] running from June 2022 until July 2025.

Objectives

The project's **overall goal** is "*to engage a diverse, international community of teachers, student teachers and teacher educators to develop their teaching sustainability competences through participation in professional learning communities, events and activities and in the co-creation, piloting and ongoing adaption of learning and teaching materials.*"[2]

Stakeholders

The project seeks to engage a diverse international community comprising teachers, student teachers, and teacher educators. The **consortium partners of TAP-TS** include representatives from higher education institutions, secondary schools, a ministry of education agency, an education technology company, a sustainable education civil society organisation and an evaluation firm. The partners cover seven different countries (AT, BE, CY, DE, IE, PT, SE). Via two main strands of activities, TAP-TS hopes to address the complexity of teaching sustainability:

- **Learning & Teaching Packages** (LTPs) consisting of seven open resource online coursessubdivided into different learning units that teachers and educators can combine and use independently. The LTPs are expected to have practical and professional implications[3], providing valuable education materials and resources for educators.

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1   Erasmus+ Teacher Academies are a flagship action of the current Erasmus+ programme. The goal is to create European partnerships of teacher education and training providers and boost the European and international dimensions of teacher education in Europe.' https://education.ec.europa.eu/focus-topics/green-education/learning-for-the-green-transition

2   https://tap-ts.eu/mod/page/view.php?id=775&forceview=1

3   Professional development and growth are conceptualized as encompassing more than the delivery of teaching and learning materials. They involve offering inspiration to educators through the provision of ideas, guidance, and reflective questions.

- **Teacher Learning Programme** including hybrid, active learning events, online workshops and face-to-face summer schools.

The main **outputs** of the project are the Teacher Learning Programme and the Learning Teaching Packages. All seven LTPs have been published on the TAP-TS website[4], providing free access for teachers. Interview partners highlighted that the LTPs "*are seen as fine rather than final versions*" as the content needs to stay "adaptable" for teachers/educators to use as needed and develop different pathways towards teaching sustainability. LTPs are designed as incentives/stimulus for educators to engage with various aspects of sustainability education, to be adapted and further developed by teachers in relation to their learners and contexts of practice. The online availability of these materials is aimed at facilitating widespread dissemination and access, enhancing the reach and impact of the project.

The main objectives are:

- To contribute to the improvement of teacher education policies and practices in Europe,

- To enhance the European dimension and internationalisation of teacher education,

- To develop and test jointly different models of mobility (virtual, physical and blended) in initial teacher education and CPD,

- To develop sustainable collaboration between teacher education providers to have an impact on the quality of teacher education in Europe and inform teacher education polices at European and national levels.

The **assessment/measurement** of outputs and outcomes employs a comprehensive approach encompassing both quantitative and qualitative dimensions:

- Quantitatively, the project collects data such as the number of participants engaging in the Teacher Learning Programme activities. Also, the dissemination of published resources as Open Educational Resources will be tracked, providing insights into the project's broader educational influence and reach.

- On the qualitative front, the assessment involves obtaining feedback on the impact of the Learning Teaching Packages (LTPs) directly from participants of the Teacher Learning Programme activities. The alignment of LTPs with the GreenComp framework is evaluated to ensure cohesion with contemporary sustainability education principles.

The **evaluation within and of the project** has and will involve various methods such as SWOT analysis, surveys, interviews, and impact measurements through a theory of change approach. The project aims to continuously **adapt its strategies**, set moving goals and emphasise the need for improvement in the application of GreenComp. Notably, the project management follows an overarching theory of change, encouraging collaborative input and ensuring a clear connection between Learning Teaching Packages (LTPs) and GreenComp.

2 The use of GreenComp

The GreenComp framework is a central building block for the main activities and outputs of TAP-TS. While a limited number of **other competence frameworks** – for example the UNECE Framework – were reviewed for usability, GreenComp was chosen because it was the newest competence framework that was clearly European and would, therefore, be applicable and adjustable for all project partners.

The materials of the **Learning & Teaching Packages** show the connection between learning and teaching activities and the competences, which are learning outcomes. This is an important bridge between quite abstract learning outcomes and practical classroom activities and resources. Accordingly, the LTPs contain a **description of the GreenComp competence areas and specific competences** addressed and should thereby help teachers understand and apply the competences in GreenComp.[5] Nevertheless, it is important to highlight that the

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4   https://tap-ts.eu/course/index.php?categoryid=16

5   While the project is currently finalising the LTPs, a first broad analysis of the GreenComp coverage has shown that the LTPs currently focus on competences such as valuing sustainability, systems thinking and critical thinking while political agency, resilience and adaptability are less covered. This emphasis is partly attributed to the focus on primary school and the inherent complexities in addressing aspects like political agency at this level.

project does not predefine which or how many of the GreenComp competences need to be covered by each LTP. The LTPs are large collections of units, activities and resources and all connect with GreenComp, but also address competences not included in GreenComp (e.g., building community and building empathy).

Figure 11 Content / Themes of the Learning & Teaching Packages[6]

A Sustainable Europe: Content, Competencies & Approaches for **Secondary** Teachers	**Sustainability & Digitality:** Content, Competencies & Approaches for **Primary** Teachers	**Sustainability & Environmental Education:** Content, Competencies & Approaches for **Primary** Teachers	**Climate Crisis Resilience:** Content, Competencies & Approaches for **Secondary** Teachers
Dealing with Climate Disinformation: Content, Competencies & Approaches for **Secondary** Teachers	**Green Citizenship in/for Europe:** Content, Competencies & Approaches for **Primary and Lower Secondary** Teachers	**Sustainable Entrepreneurship Education (SEE):** Content, Competencies & Approaches for **Primary and Secondary** Teachers	

Source: Visualisation by Technopolis Group on the basis of TAP-TS documentation.

Figure 12 Exemplary Content of First LTP "A Sustainable Europe"

In the first LTP "A Sustainable Europe"[7], participants explicitly work with the four areas of the GreenComp framework:

- In unit 1 participants explore sustainability values, sustainability thinking, sustainable futures and sustainability actions

- Unit 2 outlines European measures for sustainability, and how teachers and students can be directly involved

- Unit 3 engages educators to critically consider the potential of education to support the transition to more just and sustainable futures. The unit is divided into four sections: 'Education and Un-sustainability'; 'Decoloniality and education for sustainable futures'; 'Identities and discrimination in education'; 'Future-oriented reflection and action'.

Source: Visualisation by Technopolis Group on the basis of TAP-TS documentation.

Throughout the respective activities related to the different units, there is room to critically reflect on the content of the GreenComp framework and transfer the knowledge gained and topics discussed to one's personal or school-life.

In the **Teacher Learning Programme** element of TAP-TS, GreenComp is the source for a comprehensive survey enabling educators participating in the different events (active learning events, online workshops and summer schools) to self-assess their proficiency across the 12 GreenComp competences. Administered by the project-internal evaluation company, participants of the different TAP-TS events are asked to rank their competence levels on a scale of 1 to 7 both before and after the respective event. Although the survey design was acknowledged as intricate and time-consuming, the outcomes have proven invaluable in offering a profound insight into participants' competence levels and their learning experiences throughout the diverse range of activities.

TAP-TS also puts major emphasis on the dissemination of the developed materials, thereby raising awareness of the LTPs, and thus the GreenComp framework, for **teacher education communities** all over Europe. Although outreach to **learners** is not directly part of the project, the testing and implementation in schools is expected to bring learners' feedback.

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6   The different LTPs are to be used and applied depending on the unique needs of the teacher / educator. Thus, TAP-TS gives first suggestions around number of hours for each LTP and regarding which LTP units could be connected or require experience of other LTP units.

7   https://tap-ts.eu/course/index.php?categoryid=10

3   The context - enabling conditions and challenges

The progress of the project was influenced by a range of internal and external factors, including opportunities for collaboration, engaging individuals with the "right and open mindset", a commitment to Open Access principles,[8] and openness to changes at the policy level.

The project's **European nature** plays a pivotal role in building a common understanding of the GreenComp principles in different national contexts. Through international collaboration, teachers and educators from various European regions work collectively on developing learning and teaching materials, facilitating a collaborative approach to translating GreenComp principles into practice. This collaborative effort exemplifies how the GreenComp framework can unify different actors and approaches.

Another important enabling factor is that the consortium partners are connected to **regional and local stakeholders** (from the policy, education and public sphere), which helps spread information and interest in the project as well as in GreenComp more broadly.

Challenges identified by the project partners include:

- Establishing a **common understanding and language** around GreenComp necessitated extensive discussions among project partners. However, these discussions were perceived as an opportunity rather than an obstacle, fostering the creation of a **shared vision** among participants. The European nature of GreenComp contributed positively to this process, ensuring a sense of equality among project partners.

- New adopters or user need to **understand and translate** the framework and its annex to their individual context. Much initiative and critical reflection is needed for teachers/ educators to use the framework, adapt its content to their individual needs and extract main messages. To some project partners the framework's wording was not always clear. Accordingly, project partners with background knowledge were better able to understand the framework.

- **Ensuring coherence** across all national and regional contexts as well as education institutions was identified as a difficulty, given the diverse target groups and the need of the project partners.

- **Scepticism** towards adopting new (education and teaching) practices combined with financial and personnel constraints in many education settings posed additional obstacles.

4   Leasons learnt and recommendations

When embarking on the development of the LTPs, the project partners recognised the **necessity of elucidating the GreenComp framework early on** and created a **video** to educate project members and to reach a broader audience. This publicly available video follows a straightforward structure with clear visualisations to effectively convey the essence of GreenComp to teachers / educators and pupils, enabling them to utilise GreenComp principles. The video, coupled with further background information on GreenComp, served as a guiding resource for consortium partners involved in using GreenComp as part of the LTPs or the TLPs. This strategic preparatory step has not only facilitated a deeper understanding of GreenComp within the project, but also empowers educators that are not part of the project to incorporate GreenComp into their educational endeavours.

TAP-TS partners consider GreenComp a very **helpful and accessible** framework / guideline with which to work. They describe the four competence areas as **clear and intuitive** and the learning process as **holistic**. They repeatedly highlight the usefulness of the framework in developing a **shared understanding** between individuals/institutions coming from different national and education contexts. Further positive aspects mentioned are the inclusion of **social, economic and cultural aspects** next to the environmental focus within the framework and the multidimensionality of it, which is mirrored through the four competence areas of the framework.

Interview partners also highlighted the value of having a generic **European framework**, as

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8   The LTPs and workshops are free of charge and can be accessed by anyone who logs in on their website. Furthermore, all online-resources are translated into at least the project-partners languages.

this offers room for discussion among partners as well as room for the agency of different stakeholders to find individual ways of working with the framework.

Interview partners emphasised that GreenComp should not be perceived as a top-down approach but embraced as a **participatory framework** adaptable to the unique needs and dynamics of each stakeholder and context. TAP-TS highlights the importance of customisation and flexibility in aligning GreenComp with specific goals and contextual nuances. Interview partners highlight that GreenComp should be understood as a **bottom-up approach** with room for experimentation, discussion and idea generation. Too much regulation could possibly harm the "freeness" of the framework.

GreenComp Enterprises

"Boosting the startup of green and ethical enterprises, based on GreenComp competences"

Geographic coverage

Italy, Spain, Denmark, Greece, Sweden, Bulgaria

Type of initiative

Erasmus+
Cooperation Partner-
ships in Adult Education

E+

Timeline

November **2022**   November **2024**

Education level

Adult education

Keywords

sustainable entrepreneur-ship, business sustainability handbook, MOOC, training and mentoring

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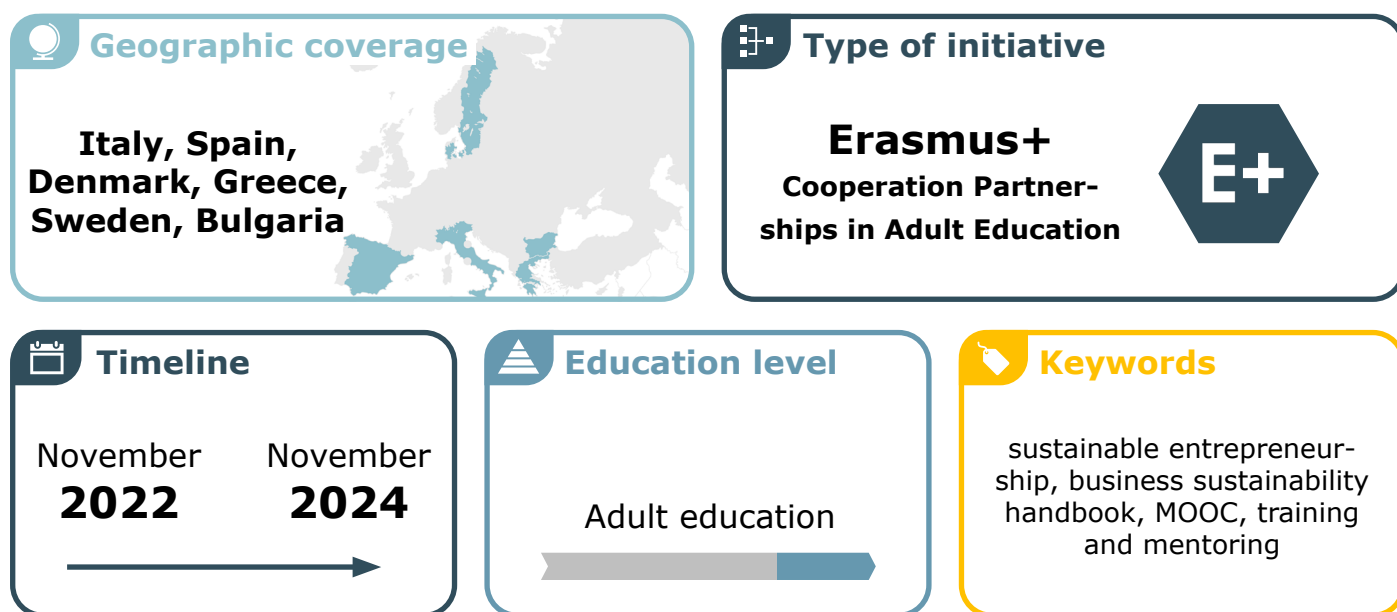
1 Overview of the case study

GreenComp Enterprises is a 24 months-long **Erasmus+ funded project**, started at the end of 2022, and focusing on adult education.

Objectives

The project set out to equip start-ups and established entrepreneurs with **skills and competences to become sustainable entrepreneurs** and to **boost the creation of innovative green and ethical enterprises across Europe**.

Stakeholders

The international **consortium** engages partners from Bulgaria, Denmark – including the coordinator DANITACOM - Greece, Italy and Sweden. The division of labour among the partners is expertise based, and it also brings together in-depth knowledge of the national context. The partners are:

- The Italian Chamber of Commerce in Denmark (DANITACOM) – project coordinator,

- Non-profit organisations: INZEB (GR) and People of 2050 (DK), both working towards sustainable and energy balanced future and on climate change and sustainability focused education.

Private organisations: Magnetar (CY), OECON Group (BG) and Materahub (IT) working across the themes of entrepreneurship, innovation and sustainable The **main activities** of the project entail:

- The development of a business sustainability handbook consisting of seven chapters, each of which discusses a topic on sustainable entrepreneurship. GreenComp provided a framework to the selection of the chapters.

- The development of accompanying digital tools containing two main parts:

- A MOOC that mirrors the seven modules of the handbook, but with interactive tools and videos. The MOOC is expected to take 30 hours to complete, and participants will receive a certificate upon successful completion, which the consortium will use to motivate people to finish the course.
- A virtual space where participants will have the possibility to connect with each other in order to communicate and create a network as well as sharing experiences and ideas.

- In addition, a selected number of entrepreneurs from each partner country can also participate in an accelerator programme that provides mentor-based training for them.

The handbook has been finished, although it is not yet publicly available, and the consortium is working on the development of the digital tools. The materials will be finalised after getting learners' feedback. The handbook will be available in six languages: English, Bulgarian, Danish, Greek, Italian, and Swedish.

Main results and deliverables

In line with the activities of the project, the **main outputs** will be the learning materials developed in the form of the sustainability handbook and accompanying digital tools.

The consulted project partners do not expect to change the mindset of vast number of people with a two year -long project , but they are confident to make a valuable contribution by raising awareness and creating accessible materials for entrepreneurs. The direct outreach of the project will be limited to selected entrepreneurs from the partner countries who can take part in the online training activities and the accelerator programme. By contributing to the creation of sustainable enterprises and products, the project also hopes to have an **indirect impact** on the preferences of the customers and consumers, who will embrace and seek out more sustainable products in the future.

2 The use of GreenComp

The project used two main sources of input for the development of the learning materials:

Six focus groups in the project countries that provided input to better understand the challenges start-up and established entrepreneurs face on their sustainability journey in various geographical contexts

The GreenComp framework - The competence areas included in GreenComp were used during the initial phase of the project, when the partners discussed and decided about the content and chapters of the business sustainability handbook, the main output of the project

The business sustainability handbook is a guide to sustainable entrepreneurship. It is divided into seven chapters which correspond to a module each. Each partner in the project is responsible for the development of a module in line with their own field of expertise. Altogether, the seven modules provide a comprehensive overview of sustainable entrepreneurship, and within each module a **specific aspect of sustainable entrepreneurship** is addressed. References to the GreenComp framework can be recognised in most chapters, in particular in module 5 which is dedicated to sustainable entrepreneurial competences:[1]

- Module 1 describes the Sustainable Development Goals (SDGs) and provides insight on how to integrate selected SDGs into business models and to communicate sustainability efforts.
- Module 2 highlights aspects of Environmental, Social, and Governance (ESG) to help sustainable business growth and support fairness in employment.
- Module 3 showcases Sustainable Business Models and helps understand the implications of the Green Deal.
- Module 4 focuses on sustainability aligned financial literacy.
- Module 5 is dedicated to Sustainable Entrepreneurial Competences.
- Module 6 discusses eco-strategies and their measurement for sustainable success, environmental challenges and opportunities entrepreneurs have to experience.

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1   The handbook is not yet published, but will be made available on the project website during 2024 - https://green-comp-project.eu

- The final, 7th module discusses why sustainability matters and offers insights into eco-friendly practices and creating shared value.

The modules also include self-assessments and questionnaires to help the learners reflect on the content of the handbook.

The consortium decided to explore GreenComp and put it at the core of their project, as the content and structure of GreenComp best suited their objectives from among the reviewed competence frameworks. They also explored DigComp and benefitted from LifeComp[2], especially in terms of the social aspects.

3 The context - enabling conditions and challenges

Not all project partners were **familiar with GreenComp** at the project initiation phase. Reading and understanding the GreenComp framework was a positive experience due to its **accessible language** which avoids jargon. Furthermore, the engagement with GreenComp helped the partners realise how much their organisation is already doing to address sustainability.

Although the project is still underway, the different **framework conditions** in the partner countries that are likely to affect the take up of the learning materials can already be highlighted. These include **various social, economic and education system-related differences**. In Greece, for example the target group of GreenComp Enterprises is reportedly more eager to find training materials and enrol in **training activities on issues related to sustainability** than their counterparts in other countries. In some other partner countries, such information is believed to be very accessible to everyone, therefore the demand is less obvious.

The partners have **not reported any significant barriers** they had to overcome so far. Work yet to be done includes the dissemination and ensuring the sustainability of the project results. However, the GreenComp Enterprise project and working with sustainable entrepreneurship should not be interpreted as a stand-alone activity for the project partners, but as an **integral part of their daily activities**. This facilitates the dissemination and outreach activities of the learning materials, and therefore indirectly of GreenComp. The coordinator, DANITACOM recently became engaged in another Erasmus+ funded adult education project, the GreenElement - Green Ecological LEad for sMall and MEDium-size eNTerprizes. The project has synergies with GreenComp Enterprises as it is aimed at developing educational materials for leaders and managers of SMEs to help develop their green leadership competences.

4 Leasons learnt and recommendations

Regarding the use of GreenComp, there is a general agreement among the interviewed project partners that it was easy to read and understand. It served as a very helpful guide. What took time was the full comprehensive understanding of the competence framework and its tailoring to apply it to their needs in each specific case.

It is important to ensure that the application of GreenComp takes the national context into account, as the systems are very different even if the needs and challenges show similarities.

There are a lot of good practice cases already available to benefit from, and before embarking on a learning material development journey, they should be assessed to see what has already been done and how the results can be incorporated in the work.

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2   https://joint-research-centre.ec.europa.eu/lifecomp_en

EntreComp4Transition

Building upon the EntreComp framework
for a green and digital transition

EntreComp for transition

Geographic coverage

Belgium, Spain, Turkey, Italy, Austria

Type of initiative

Erasmus+
Alliances for Education and Enterprises

E+

Timeline

May **2022**   May **2025**

Education level

VET, higher education

Keywords

Green, digital and entrepreneurship competences, MOOCs, open badge, learning paths
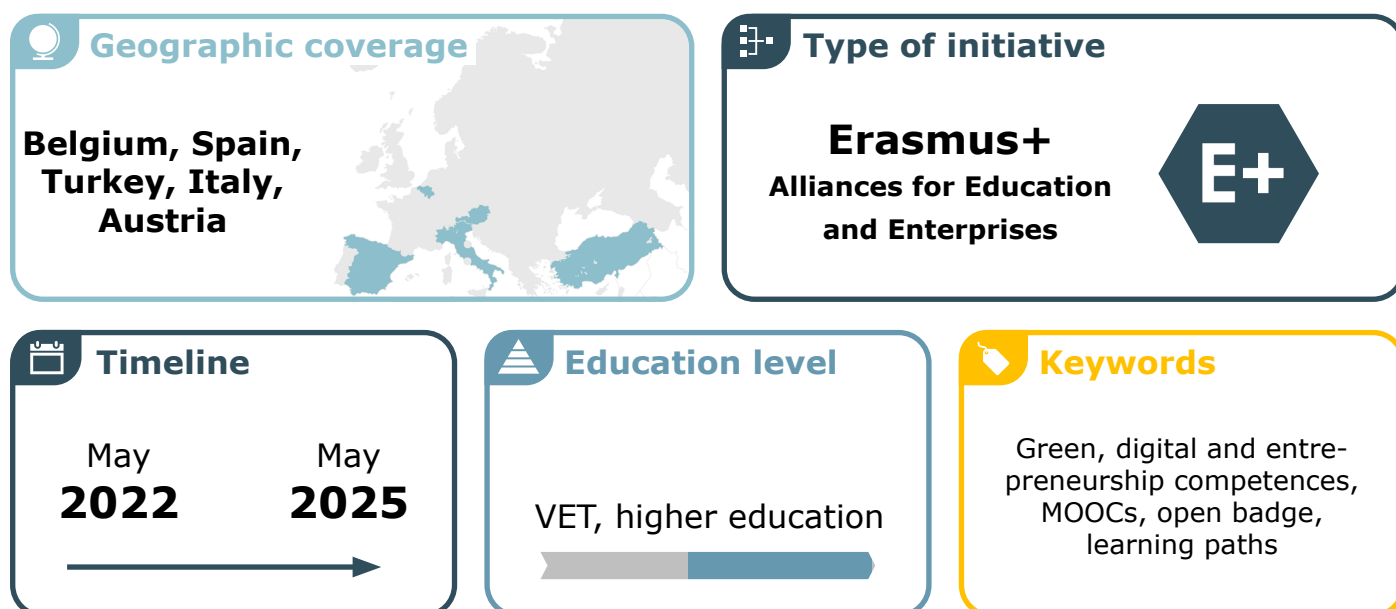
1 Overview of the case study

The three year-long **Erasmus+ funded project** is being implemented between May 2022 and May 2025. It is aimed at **supporting the development of entrepreneurial mindsets in combination with the preparation for the digital and green transitions**. Therefore, the EntreComp4Transition project put three European competence frameworks – EntreComp, DigComp and GreenComp – at the core of its activities.

Objectives

More specifically, the **objectives** of the project include:

- Supporting SMEs in green and digital transition by making available new teaching and learning materials,
- Training 'green transition facilitators' by fostering the development of entrepreneurial mindset, while ensuring recognition of learning outcomes and integrating the learning offer both by higher education and VET,
- Fostering corporate social responsibility,
- Enhancing the relevance and quality of skills development,
- Bringing together a broad range of stakeholders from the HE and VET, the public and private sectors (businesses) in a co-creation process,
- Supporting effective, efficient and innovative HE and VET systems.

The EntreComp4Transition partners implement a set of **activities** that include:

- In-depth **skills gap analysis** and an **AI-based tool** to help identify skill gaps of businesses. The self-diagnosis tool helps identify the green and digital profiles of companies[1] and

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1   https://entrecomp4transition.eu/tool/

provides an underpinning for the learning materials,

- **Innovative learning content** development in a dual blended format as opensource MOOCs aligned with the ECVET and EQAVET frameworks, pilots and a mobility scheme. The learning content offers different learning paths embedding green, digital and entrepreneurial skills and competences,
- **Open badge creation** as a means for verification for businesses on the acquired competences of the 'green transitional facilitators'.

Stakeholders

The **consortium** is led by Eurochambres, The Association of European Chambers of Commerce and Industry. It engages 14 other partners from five countries (Austria, Belgium, Italy, Spain, Türkiye):

- **Non-profit organisations** focusing on education and training: Bantani Education (BE), UCEIF Foundation (ES), IFOA (IT);
- **Higher education and research institutions**: Thomas More University of Applied Sciences (BE), University of Cantabria (ES). T2i (IT, also a VET provider), TOBB ETÜ (University of Economics and Technology, TR);
- The **public sector** of Wallonia (BE) and Extremadura (ES);
- **National chambers of commerce** from Spain, Austria (WKO, including the VET-provider department: WIFI), Italy and Türkiye;
- **A private business**: Materahub (IT);
- **IFOA** (IT, VET provider).

Target groups

The design of the project, its activities and expected **results** are guided by a skills needs assessment carried out by the involved chambers of commerce with SMEs in the partner countries. This initial assessment was aimed to ensure that the outputs of the project are deemed useful and appealing to the intended **target audience**. The project does not only target the personnel of SMEs with the learning materials and the 'Green Transition Facilitator' profile, but also students at EQF 5 and 6 levels.

2 The use of GreenComp

The project partners decided to use **all three competence frameworks** as they see entrepreneurial competences as enabling competences that can help drive the digital and green developments and change. In their views, entrepreneurial learning will always be green and digital, but it is not necessarily true the other way around. Therefore, they embarked on the development of training and learning materials that foster digital and green competences while promote the development of an entrepreneurial mindset.

The three competence frameworks were **mapped** to and used to as part of:

- The **self-assessment tool** that helps assess where learners are and how they can continue to become 'Green Transition Facilitators'. The assessment tool focuses on five competences from each of the three competence frameworks presented as integrated scenarios in an online tool developed by Ninjable[2].
- The **different modular learning paths** developed:
    - o Learning Path 1: Sustainability Practitioner – incorporating selected GreenComp competences,
    - o Learning Path 2: Digital Transformation Practitioner,
    - o Learning Path 3: Entrepreneurship Practitioner,
    - o Learning Path 4: Green Transition Facilitator.

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2   A spin off company specialised in gamification of skills and career path development - https://ninjable.io

The content of the modules was defined taking into account the results of the market analysis and the focus groups with SMEs that identified the areas in which SMEs need skilled workers and competence development, which were mapped against the content of the competence frameworks. The competence frameworks were used as a library of ideas from which to choose the right ones based on the identified problems.

Figure 13 EntreComp4Transition - Main competence areas needed by SMEs as identified from the three European competence frameworks
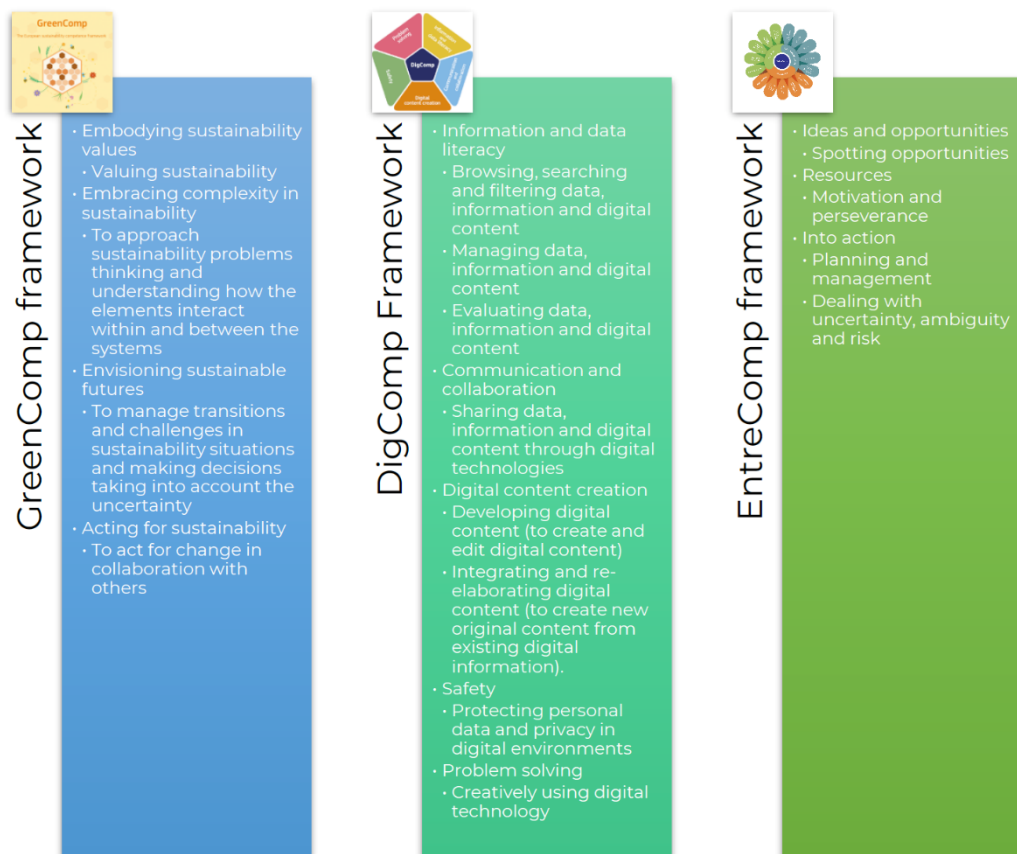
Source: EntreComp4Transition project: The future "Green Transition Facilitator" Learning path and methodology

The figure above depicts the key areas of the three competence frameworks where SMEs identified needs for competence development. When it comes to competence development in higher education, there is a **sense of urgency** to develop digital competences. This puts DigComp at the forefront of many activities in education institutions, while GreenComp and EntreComp are somewhat more on the periphery, but with growing importance, according to a project partner.

The learning materials developed by the project will be piloted by the consortium before finalisation and publication. It is expected that undertaking all learning paths and reaching the level of Green Transition Facilitator, requires approximately four months or 75 hours of learning.

As summarised in the table below, the different modules within the four learning paths focus on the development of various competence areas, and the Green Transition Facilitator brings it all together. Each module and unit within have a set of learning materials (e.g. video tutorials, papers, articles, mapping tools) evaluation methods and learning outcomes assigned as well as the knowledge and skills to be developed set out. Each learning path will be awarded with a badge to acknowledge the achievements.

Figure 14 Modules in the different learning paths

Learning path 1 – Sustainability practitioner – green skills	Learning path 2 - Digital Transformation Practitioner – digital skills	Learning 3: Entrepreneurship Practitioner

▪ **Module 1.1 Valuing Sustainability**
  o Sustainability Systems Thinking
  o Managing Transitions
  o Envisioning Futures
▪ **Module 1.2 Sustainability in Business**
  o Renewable Energy
  o Circular Economy
	▪ **Module 2.1 Online Collaboration and Communication**
	  o Digital and new media literacy
	▪ **Module 2.2 Artificial Intelligence and Data**
	  o Application of Artificial Intelligence
	  o Data Analysis
		▪ **Module 3.1 Opportunities and Creativity / Innovation**
		  o Opportunity Discovery Canvas
		  o Design Thinking and other Tools for creation, co-creation and innovation
		▪ **Module 3.2 Business Model Navigator**
		  o Business

Learning Path 4: Green Transition Facilitator		
▪ **Module4.1 Status quo: Green, Digital and Entrepreneurship Assessment** ▪ **Module 4.2 Twin Transition Strategy Development**		

Source: EntreComp4Transition project: The future "Green Transition Facilitator" Learning path and methodology

3   The context - enabling conditions and challenges

Some of the project partners, including Bantani Education and Thomas More UAS, **have a deep understanding and a long track-record** of working with EntreComp and more broadly with entrepreneurship competence developments and learning design. Such **expertise was a key enabling factor** to be able to dive into the content of the competence frameworks and translate them into practical applications as part of the design of the self-assessment tool and learning materials.

The project is still ongoing, but the team has experienced some **challenges when they worked on combining the various competence frameworks**. These were related to identifying and selecting the competences to be included in the self-assessment tool and the learning materials. The competences included in the three frameworks are numerous. The initial assessment of the competence needs of SMEs was highly valuable as input, but there was no linear connection between the competence needs of SMEs and their context. Therefore, deciding on which skills and knowledge to focus during the learning paths development was challenging. The team used their expertise to arrive at a selection of skills and knowledge areas as the basis for the development of the various learning materials. The materials will be piloted in the next phases of the project, and refined as needed.

According to the partners, EntreComp and GreenComp **fit well together / complement each other well** because they represent the **skills all learners need** to be able deal with the current uncertain world affected for example by extreme weather effects or the cost-of-living crisis. GreenComp addresses wicked problems, and an education that is focused on developing entrepreneurial mindset provides an engaging and authentic learning experience that also aims to create value to others.

There are, however, **differences across the three competence frameworks** in their phrasing and content, which have to be taken into account for the project's application:

• EntreComp provides information on and support for ideation and agency to drive other competence developments.

• GreenComp provides inspirations for how one should create value in support of sustainability.

- DigComp provides a suite of technical tools and focuses on technical competences and knowledge.

In terms of the language used, EntreComp uses less academic language than GreenComp, and the latter is regarded to be a step further away from the language used by practitioners.

4 Leasons learnt and recommendations

Although the project work is still ongoing, some lessons have been learnt, and early recommendations emerged.

- For the use of any competence frameworks, **ensuring adaptation to the context while retaining transversality is vital**. Additional guidance on how to implement the GreenComp framework would be useful to facilitate its use.

- The competence frameworks should be used by applying a **step-by-step approach**. While they were designed to be comprehensive, it is often not feasible to address all dimensions at once. However, one can start with a few selected competences then can continue addressing others at a later step.

- There are **many useful tools already available** that could help with the use of competence frameworks. One of these is the recently published Scaffold[3] that provides a card set for educators to help design learning activities addressing the four – including LifeComp – European competence frameworks.

- It is key to **link the learning outcomes to the competence development** to be able to provide a clear offer for the learners and convince future or current employers of the benefits of undertaking the different learning paths.

- The development of the **learning paths and modules took months**, which was planned, therefore not necessarily a challenge, but the resource intensity of such endeavour needs to be acknowledged.

- There is a need to further **enhance the visibility and understanding about GreenComp**, and there are different activities that can contribute:

  o Training opportunities that offer insight into various possible uses and help with the interpretation are always valuable. Training an international group of participants, which creates a network and has a motivational power, has great potential to accelerate the take up of GreenComp.

  o The various communities of practice – GreenComp and EntreComp – have good potential as they gather with like-minded colleagues. They can help interested people with peer advice about emerging ideas on the use of the competence frameworks.

  o Making case studies, inspiring practices and projects available that showcase a variety of uses of the competence frameworks. An example of such effort is the EntreComp playbook that contains 150 examples of practices of how people are using the EntreComp framework across various education levels from kindergarten to higher education.

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3   www.etf.europa.eu/en/what-we-do/scaffold-card-game-revolutionise-teaching

Engineers for Europe
(E4E)

ENGINEERS 4 EUROPE

Geographic coverage

International/ Europe-wide

Type of initiative

Erasmus+
Key Action 2 - Alliances for Innovation

E+

Timeline

September **2022**   August **2025**

Education level

Higher education, VET, adult education

Keywords

engineering profession, skills mistmatch, trasversal skills, skills strategy, microcredentials
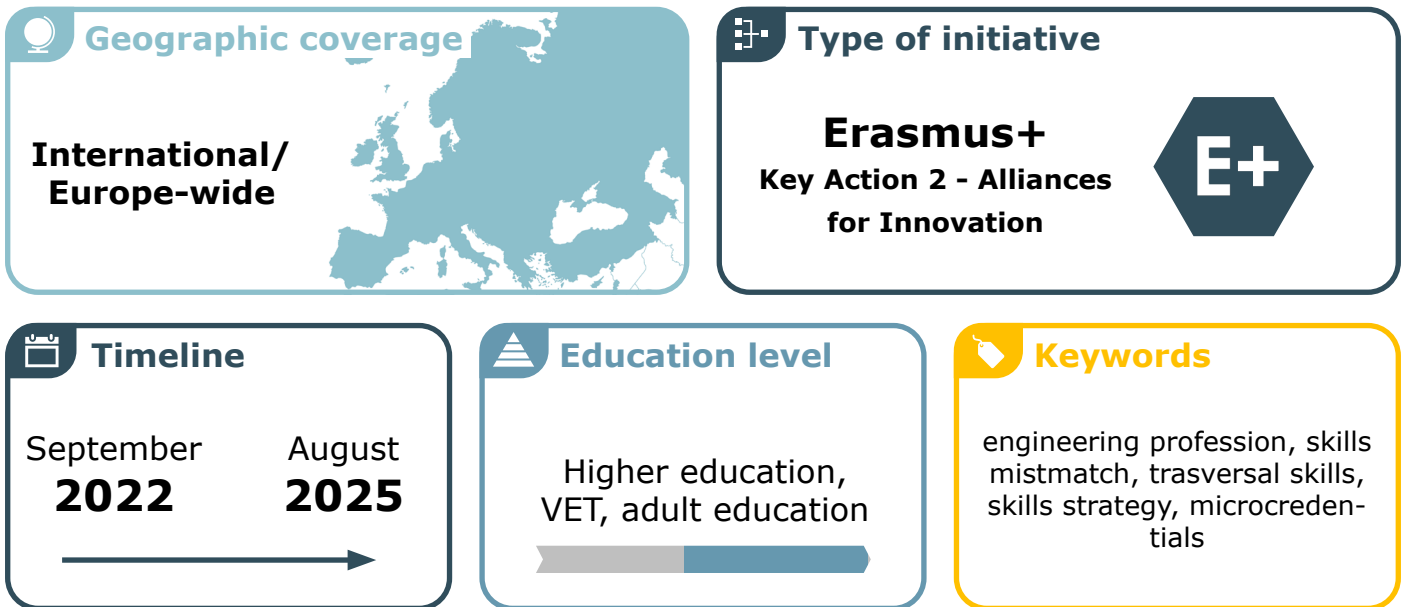
1 Overview of the case study

Engineers for Europe (E4E) is a three-year long Erasmus+ Alliances for Innovation[1] project running from September 2022 until August 2025.[2] The project addresses key challenges in the engineering profession especially skills mismatch, the increasing skills gaps in transversal skills, closing the distance between the worlds of education and work, and the shortage of 'socially driven engineers.' The project is defined as 'not an academic endeavour but **an operational answer to the many challenges of the engineering profession in Europe**.'

Objectives

The primary objective of the project is **to enhance the innovation and resilience of European engineers by enabling them to acquire new competences** and skills such as digital, green, resilience, and entre preneurial ones. More specifically, the project aims to:

- Contribute to strengthening the capacity of the engineering profession to address EU's societal challenges and priorities, such as digital and green transformations and decarbonisation;
- Bridge the gap between education, training, and industry in the engineering field;
- Implement EU competence frameworks, including DigComp, LifeComp, EntreComp and GreenComp in the context of the engineering profession.[3]

Target groups

With a focus on both formal and non-formal education, the key **target groups** of the project are teaching staff in higher education, VET teachers and trainers, and also professional associations and engineering bodies driving the direction of continuing professional development (CPD) for practitioners.

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1   KA-234-LOT1: Alliances for Education and Enterprises. Project ID: 101054872. https://erasmus-plus.ec.europa. eu/projects/search/detailins/101054872 (last accessed 21/02/2024)

2   Engineers for Europe. *The E4E Common Methodology to Assess, Anticipate and Monitor the Evolution of the Engineering Profession with a Focus on Competences* (no date given), p. 3. https://engineers4europe.eu/sites/default/ files/2023-06/E4E%20Methodology.pdf

3   Ibid, p. 4. GreenComp added following case study interview. The project's published main objectives do not reference GreenComp as one of the Frameworks as GreenComp was not yet launched at the time of submitting the proposal.

Stakeholders

The project consortium consists of 13 project partners and 12 associated partners from eight countries. The project coordinator, **Engineers Europe[4]** is a federation of professional engineers that gathers national engineering associations from 33 European Higher Education Area (EHEA) countries. The partnership involves three main types of organisations:

- Professional bodies and national associations - **Association of European Civil Engineering Faculties**, **Verein Deutscher Ingenieur** (DE), **Ordem dos Engenheiros** (ES), **Federation of European Heating Ventilation and Air Conditioning Association, European Council of Engineers Chambers** - providing insights regarding the nature of the gaps between the university and training provision, and the skills required in the profession, shaping the competences and the learning outcomes for the micro-credentials developed;
- Accreditation bodies - **National Agency for Quality Assurance and Accreditation of Spain, Engineers Ireland**;
- Higher education and training institutions - Faculty of Engineering at the **University of Porto** (PT), **TU Dublin** (IE), **KU Leuven** (BE), **Newport Group** (SK), **Institute of Industrial and Business Education & Training** (GR).

Main results and deliverables

The project's main deliverables are:

- The establishment of the **European Engineering Skills Council**, a multi-stakeholder EU platform for enhanced dialogue and collaboration between representatives of education, training, industry and employers. It had its first meeting in September 2023.
- A monitoring methodology developed to gauge the dynamics, challenges and opportunities of the engineering profession, culminating in the yearly **Engineering Skills Strategy,** and **an observatory for engineering skills development.** The Observatory is intended as a mechanism through which recommendations can be made for national bodies and professional associations to adapt their standards to include sustainability competences among the minimum requirements for the engineering profession.
- The development and delivery of the E4E Curriculum, **an innovative training for transversal competences and skills** in the form of **micro-credentials.**[5] The intention of the short courses is to **raise awareness about the importance of sustainability competences for engineers** while also providing the opportunity to develop and improve them. The micro-credentials, which will be made **available online for free to encourage professionals to participate,** are aimed at qualified engineers as continuous professional development (CPD).

As for expected impact, the project aims to **ensure that sustainability and environmental concerns have a better visibility in the engineering profession**, both in formal education and in continuing professional development.

2 The use of GreenComp

While prior to embarking on the project the partners had limited awareness regarding GreenComp and the other European competence frameworks, GreenComp competences are weaved into all main deliverables:

- The Engineering Skills Council utilises **GreenComp as a theme** to facilitate dialogue and collaboration between industry, education and training.
- The background research for the development of the E4E Skills Strategy underlined the importance of **incorporating** social values, including **sustainability competences, into both formal engineering education and the existing professional frameworks** for practising engineers. The Skills Strategy will therefore actively address the inclusion of sustainability competences, providing a mechanism for enhancing the engineering profession's awareness of GreenComp while also developing an approach to expanding the social role of engineers.

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4   https://www.engineerseurope.com/
5   https://engineers4europe.eu/sites/default/files/2022-11/E4E%20Project%20Summary.pdf

- As part of the innovative training deliverable, the project is developing a series of **micro-credentials** with one of the courses fully dedicated to sustainability and GreenComp. The twelve competence areas of GreenComp will serve as the basis for the sustainability and green-based learning outcomes of the micro-credentials. There are three green skills related micro-credentials planned: one on the United Nations Framework Convention on Climate Change and Green Deal, another on Sustainability and a third on Environmental Responsibility.[6] Upon completion, learners will have their micro-credentials recorded in a E4E Skills Passport.

Through the Skills Council and the E4E Skills Strategy and Observatory for skills development, national bodies will be able adopt and apply the competence development approach encompassing DigComp, LifeComp, EntreComp, and GreenComp in their national contexts across Europe.

3 The context - enabling conditions and challenges

GreenComp and the three other competence frameworks provide the practical foundation for E4E to operationalise the project's main objectives and deliverables. These competence frameworks offer a **common language and a reference framework** to facilitate discussion and collaboration between education and work on skills mismatches and competence development. The project partners found that identifying the specific gaps between educational offers and industry needs are particularly challenging. The competences and the corresponding descriptors of GreenComp are the guiding tools for these discussions that seek to map sustainability competence requirements for engineering. GreenComp also plays a role in the forthcoming solutions development phase where the **sustainability themed micro credentials** will have their content and learning outcomes mapped against the competence framework.

Project partners were conscious that GreenComp was developed by the Joint Research Centre (JRC) of the European Commission, which gave the framework a **solid academic foundation**. This was an important factor for all partners, but particularly for the education providers, professional and national bodies. Reflecting on the ongoing project of adapting GreenComp and the other European Competence Frameworks for engineering, the partners noted that these Frameworks provide very detailed, complete and theoretical models. These characteristics position the Competence Frameworks as well-placed **roadmaps** for this work.

Reflecting on the comparison carried out by the partners between GreenComp and the UNESCO Education for Sustainable Development[7] frameworks for the purposes of their project, GreenComp was regarded as **more concrete and tangible** whereas UNESCO's approach felt rather aspirational, containing too many descriptors. GreenComp contains actions that partners found **can be easily tailored** to the focus of the project, with the 'acting for sustainability' chapter and Annex 2[8] proving especially valuable. Additionally, the project is working with three other competence frameworks, DigComp, LifeComp and EntreComp, therefore GreenComp also fits with this European competence frameworks approach well. The only limiting point highlighted was that GreenComp as a competence framework is not yet widely known.

4 Leasons learnt and recommendations

In terms of the application of the competence frameworks and the implementation of the project, the Engineers for Europe project partners represent various key stakeholders in the engineering profession's ecosystem, which created the ideal partnership to develop a **holistic yet easily adoptable approach to skills and competence development** building on the European Competence Frameworks, including GreenComp. This approach taken was due to the early realisation of the partners that the frameworks they are developing need to be flexible, accessible and easily adaptable across contexts and geographies, otherwise the adoption rate

6   https://engineers4europe.eu/sites/default/files/2023-10/2nd%20Joint%20Conf%20EUCEET%20AECEF_BO-CHAR%20.pdf

7   www.unesco.org/en/sustainable-development/education

8   Bianchi, G., Pisiotis, U. and Cabrera Giraldez, M., *GreenComp. The European sustainability competence framework*, Punie, Y. and Bacigalupo, M. editor(s), EUR 30955 EN, Publications Office of the European Union, Luxembourg, 2022. Available at: https://publications.jrc.ec.europa.eu/repository/handle/JRC128040

will be low.

E4E is developing a methodology that is not only flexible and offers the possibility to be adapted across countries but also has a built-in **monitoring mechanism that will facilitate the continuation of competence development** in the fields of sustainability, digital and entrepreneurship beyond the project's lifecycle.

The project's approach of **adapting the four competence frameworks** to help 'answer' the skills challenges of the engineering profession could be replicated across various other professions, provided they can be aligned with existing standards of practice. The vital **role of professional bodies and professional associations** during any such adaptation process has to be emphasised.

GreenComp is **fairly recent** and thus not yet widely known or adopted, highlighting the importance of continuing to widen its reach. The project aims to contribute to this by **building bridges between education and training** and industry, facilitating conversations across these sectors regarding the **urgency to address sustainability topics.**

Good practice examples and case studies are valuable to **raise awareness** about GreenComp and its applications across various sectors to help support adoption across multiple professions. As particular examples, one further project and two proposals were mentioned: Arts4People&Earth project from Portugal,[9] a proposal for a Competence Framework for Sustainable Construction Safety,[10] and another proposal to include GreenComp in the Learning Outcomes Frameworks of the Erasmus+ project CALOHEE.[11] Additionally, while not focusing exclusively on GreenComp, education providers from the consortium shared good practice examples on practical applications of the four frameworks as inputs for the formulating Engineering Skills Strategy. One such example utilising GreenComp was the Socratic debate organised for engineering students on green skills at the 2023 International Conference of the Portuguese Society for Engineering Education.[12] Finally, the theme for this year's World Engineering Day (4 March) was 'engineering solutions for a sustainable world'.[13] Project partners participated in global events and collected good practice approaches that may also inform the developing Skills Strategy.

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9   Arts4People& Earth is a collaborative arts and science& engineering project in Portugal, where arts support visualizing the importance of sustainability, raising awareness, helping to frame the message and reaching a broader audience. https://education-for-climate.ec.europa.eu/community/group/education-climate-day-2023/topic/arts-4-people-and-earth

10   https://education-for-climate.ec.europa.eu/community/sites/default/files/2023-08/ISHCCO%20and%20GREEN-COMP.pdf For more on the International Safety and Health Construction Coordinators Organization (ISHCCO), see https://www.ishcco.org/ Following this proposal, the ISHCCO framework was updated to include references to sustainability.

11   Comparing Achievements of Learning Outcomes in Higher Education in Europe (CALOHEE) www.calohee.eu/. In phase 2 (Calohee2), a working group led by the interviewee provided an initial report on including GreenComp in the Learning Outcomes Frameworks of the project. https://education-for-climate.ec.europa.eu/community/GreenComp-CommunityGroup/topic/greencomp-and-learning-outcomes-framework-calohee

12   Unpublished case study from E4E document entitled 'Best practices: Skills gaps initiatives.' Information courtesy of E4E project.

13   https://worldengineeringday.net/

The Assessment of Sustainability Knowledge
TASK™

TASK BY Sulitest

Geographic coverage

Belgium/ international

Type of initiative

Private initiative

Timeline

since
2012

Education level

Higher education, adult education

Keywords

online assessment, sustainability knowledge, certificate
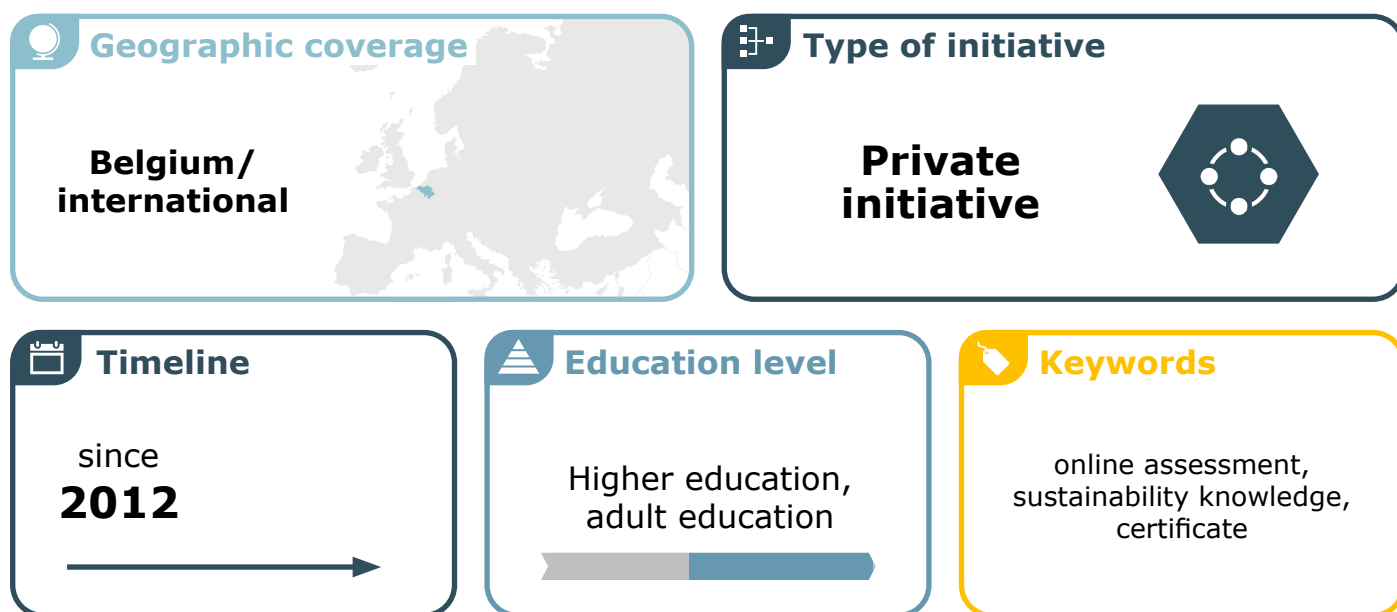
1 Overview of the case study

Sulitest[1] is a movement born out of the United Nations Conference on Sustainable Development in 2012[2] powered by a non-profit organisation and a social and solidarity company. Sulitest's purpose is to equip organisations with tools and data that enables them to better design, deliver, and demonstrate the positive impact of their actions to improve the sustainability literacy of their stakeholders.

Over the past years, universities, companies and even political parties have begun to declare their commitment to the planet and have increasingly made the decision to become leaders in sustainable development. In 2023, Sulitest decided to strengthen its sustainability impact by setting the standard for universities and organisations.

Sulitest launched TASK™, **The Assessment of Sustainability Knowledge**,[3] the first online international certificate assessing sustainability knowledge that is accessible and easy to implement, reliable and globally comparable.

Target groups The TASK™ tool provides a robust, research-based, and online assessment process leading to an internationally recognised certificate of sustainability knowledge. While curriculum and pedagogical transformation takes multiple forms across diverse contexts, TASK™ aims to provide a common language on sustainability for all, regardless of the degree, specialisation, profession, or business sector.

TASK™ is a questionnaire which comprises of 112 multiple-choice questions, available in English and French, to be completed in 80 minutes and test-takers receive a certificate which can be used on their CV or LinkedIn profile.

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1   www.sulitest.org/
2   https://sustainabledevelopment.un.org/rio20
3   www.sulitest.org/tools/task

TASK™ is **aimed** at allowing:

- Students and individuals to understand and demonstrate their knowledge of sustainability.

- Universities and companies to measure the level of sustainability knowledge, inform strategy, and demonstrate impact.

- Ranking and accreditation bodies to have relevant, robust and comparable data on sustainability knowledge.

TASK™ assesses four different types of sustainability knowledge: descriptive, contextualised, causal, and integrated. Each type is organised under one of two unifying forms of human cognition: Knowing and Understanding, and Interlinkages. The two forms of cognition and four types of knowledge are presented in the table below.

Figure 15 TASK™ forms of cognition and knowledge

1. Knowing and Understanding	2. Interlinkages
i. **Descriptive knowledge** (definitions and key sustainability concepts)	**i.** **Causal knowledge** (major causes)
ii. **Contextualised knowledge** (current sustainability state and trends)	**ii.** **Integrated knowledge** (systemic impacts)

Source: Sulitest TASK™ official website

When creating questions for each of these categories for the assessment, the task force articulated guidelines for distinguishing among the types of knowledge.

TASK™ is accessible via a **user-friendly platform**. The online platform provides relevant and comparable metrics for monitoring and steering education for sustainability across any educational programme. So far, 35 universities[4] and business schools have committed to certifying a majority of their students with TASK™ within three years.

2 The use of GreenComp

The development of TASK™ involved a series of steps:

- Defining the model of sustainability knowledge;

- Assessment design and question/item development;

- Pilot testing, sampling, and data analysis for internal consistency, robustness reliability, and validity;

- Launch and continuous improvement via an iterative process of quality control.

The first foundational phase of defining their **model of sustainability knowledge** and mapping such knowledge onto a matrix was the most important step. For defining the sustainability knowledge model, the Sulitest team conducted an extensive literature review. While conducting this review of the sustainability education landscape and sustainability competence frameworks, Sulitest learnt about the GreenComp framework. Given Sulitest's goal of supporting higher education institutions (HEIs) with integrating competence frameworks into the curriculum and into the training of future decision-makers, they found **GreenComp aligned with the company's sustainability goals**, as it articulated four different areas of competences which would prepare individuals for building a sustainable future. When defining the tool, the team ensured that TASK™ tapped into **cognitive skills, critical thinking and systems thinking competences**.

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4 www.sulitest.org/tools/task

At the end, TASK™ incorporates and builds upon the following sources:

- The European GreenComp sustainability competence framework - The third competence area of GreenComp - Envisioning sustainable futures - is particularly interesting and relevant for TASK™ due to the vision for sustainability at its core.

- The UNESCO Education for Sustainable Development Goals (SDG): Learning objectives.[5]

- A reference framework that was developed for the French Ministry of Higher Education, Research and Innovation "Raising awareness and training on the challenges of ecological transition and sustainable development in higher education"[6].

- The four-dimensional Competencies/Sub- competencies Framework focusing on knowledge, skills, character, and meta-learning, devised by the Center for Curriculum Redesign.[7]

Despite the scope of TASK™ being both wider and more specific than the GreenComp framework, the Sulitest TASK™ content is in alignment with each of the four competence areas and the sub-areas of GreenComp. GreenComp was used a **key source of inspiration** to define the sustainability knowledge domain of TASK™. This domain of TASK™ is fully **aligned with the four GreenComp competence areas**, as shown in the heat map below.

Figure 16 Sulitest TASK™ content alignment with the GreenComp framework

Area	1. Embodying sustainability values		
Competence	1.1 Valuing sustainability	1.2 Supporting fairness	1.3 Promoting nature
Knowledge			
Skills			
Attitudes			

Area	2. Embracing complexity in sustainability		
Competence	2.1 Systems thinking	2.2 Critical thinking	2.3 Problem framing
Knowledge			
Skills			
Attitudes			

Area	3. Envisioning sustainable futures		
Competence	3.1 Futures literacy	3.2 Adaptability	3.3 Exploratory thinking
Knowledge			
Skills			
Attitudes			

Area	4. Acting for sustainability		
Competence	4.1 Political agency	4.2 Collective action	4.3 Individual initiative
Knowledge			
Skills			
Attitudes			

Alignment Heat Map **Legend**	**Full** 100%	**High** 50-80%	**Low** 20-40%	**None** 0%

Source: Sulitest TASK™ official website

5   https://unesdoc.unesco.org/ark:/48223/pf0000247444
6   www.enseignementsup-recherche.gouv.fr/fr/sensibiliser-et-former-aux-enjeux-de-la-transition-ecologique-dans-l-enseignement-superieur-83888
7   Fadel, Bialik & Trilling, 2015, Four-Dimensional Education: The Competencies Learners Need to Succeed, Center for Curriculum Redesign (CCR). https://curriculumredesign.org/framework/

3 The context - enabling conditions and challenges

A reflection by the developers of TASK™ on GreenComp included, that it does not only **help raise awareness** about the importance of learning for environmental sustainability, but it also **fills a gap within the education sector** where the focus is on disciplines rather than the transversal skills and competences citizens need to build a sustainable future for themselves and those around them. All four competence areas of the framework are needed to equip citizens facing the complex sustainability challenges of today's world.

GreenComp depicts competences necessary for sustainability as an overarching topic. **It does not address competences** such as responsible production and consumption, competences for the circular economy, or competences for specific education levels. Due to the vast and rapidly evolving nature of the sustainability concept many more specific areas will emerge.

Although widely endorsed by subject-matter experts and representatives of different stakeholder groups, due to the recent launch of the framework a **perceived challenge** is that it **has not been tested in a real setting as yet**.

The framework can be **quite easily adapted** based on the experience of Sulitest, however its **implementation could be** greatly **facilitated** by the existence of case studies and best practices to inform the 'translation into practice' process.

4 Leasons learnt and recommendations

The framework should be **perceived and treated as a guide**. GreenComp provides a framework and reference to drive the necessary sustainability change in education institutions and their curriculum. However, for academics within universities to be able to integrate GreenComp into the curriculum, the **need to adapt the framework and translate it into clear goals** in line with their learning objectives, has to be emphasised. It would be useful to have access to **examples and best practice** on **how to translate** GreenComp into reality, pedagogical moves and assessment mechanisms or **how to appropriate** it with **learning goals**, how to track progress on the incorporation of GreenComp into the curriculum.

There could be future amendments and revisions of **GreenComp** envisaged based on **evaluations of its use** in practice in various contexts**. Further drivers of future developments** of the competence framework might also include changes in production and consumption, competences needed for the circular economy, or distinctions made between the competences for specific education levels.

Learning for environmental sustainability is essential to achieve a sustainability mindset and trigger the willingness to act for a sustainable future. However, education and training only form part of addressing the challenge. **Systemic change towards sustainability** is a global necessity and a shared responsibility. Investments are needed in research and innovation, laws and regulations, technological eco-innovations, transparency and accountability.

Open Universiteit

Open Universiteit

Geographic coverage

The Netherlands

Type of initiative

Institutional initiative

Timeline

since **2023**

Education level

Higher education

Keywords

Insitutional change, GreenComp adaptation, good practices
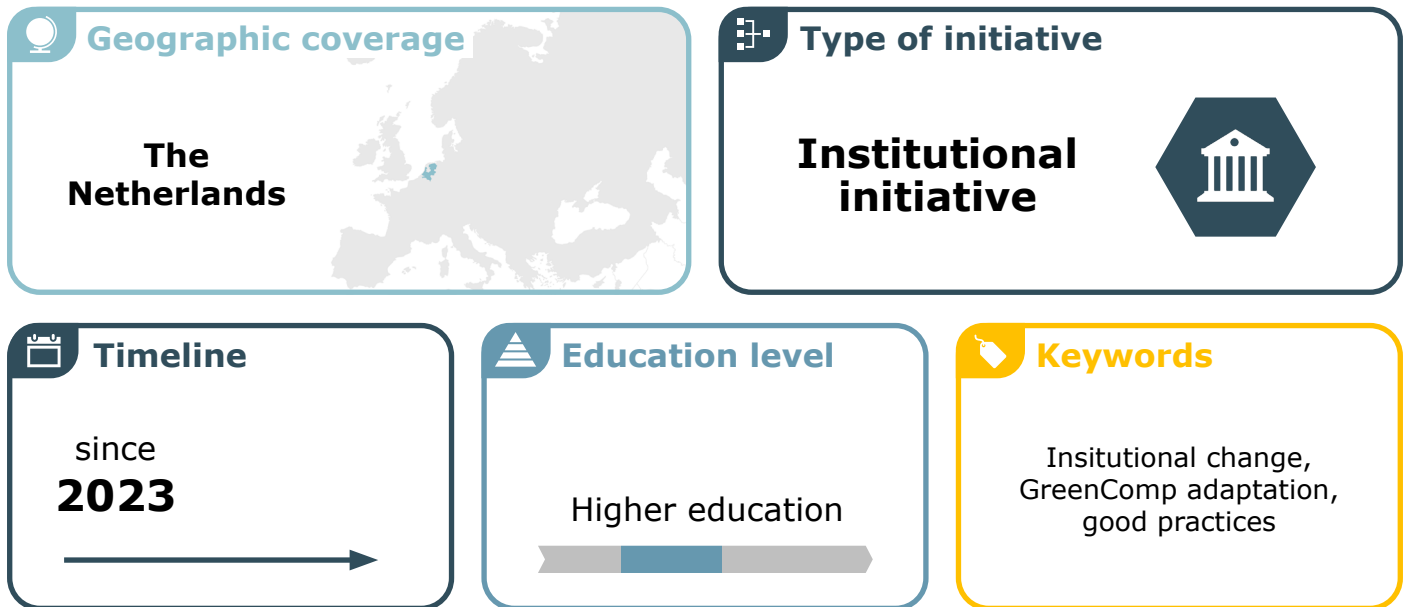
1 Overview of the case study

The present initiative is currently being implemented at the Open Universiteit (OU) in the Netherlands and is aimed at **developing good practices for the adaptation and implementation of the GreenComp framework to faculties and education programmes** at the OU. The initiative is led centrally by a small coordination team at the OU and representatives from all faculties[1] are involved to represent academic staff as a whole. The objective is to collaborate with all academic elements of the OU and to formulate official **recommendations suitable and actionable to every department**. In addition, the team has managed to engage OU's green office.[2]

Objectives

The initiative is taking place within a wider **internal quality assurance framework** of OU. Following an institutional funding initiative, the coordinators received a budget of €100,000 to run the activities for a year. This entity involves the salary of one FTE for the same period, spread out over a small group of colleagues.

Target groups

While the initiative is internally focused, the results and lessons will be disseminated outwardly, e.g., at higher education conferences or symposiums. First outputs and learnings from a predecessor project adapting the Green Comp Framework to one Master programme resulted in a publication in the book 'Sustainability in Higher Education: Strategies, Performance, and Future Challenges'.

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1 Faculties of The Open University: Science, Humanities, Management Sciences, Educational Sciences, Psychology, Law.

2 The Green Office develops various activities in the field of sustainability appropriate to the OU as an educational institution.

While the consulted colleagues were familiar with other green competences frameworks (such as the UNESCO framework "Education for sustainable development goals: Learning Objectives") working with a framework of the European Union was of particular interest. In general terms, the framework was deemed to be an optimal starting point for talking about sustainability to diverse types of audience. Conceptually, it was found to be an ideal tool for providing a complete and shared understanding of the sustainability topic as a whole.

There are several phases to the present initiative outlined in the following.

Phase 1: Scanning

To begin with, the coordinators examined the framework to look for connections between the GreenComp competences and existing competences in academia (such as systems thinking). This was conceptualised as an **interactive 'curriculum scan' of each faculty** individually and the process involved document analysis and interviews with staff and students. In the interest of ensuring the relevancy of the assessment, they opted to determine different units of analysis for each 'scan' (i.e., individual modules or entire degrees/courses). As a result of the curriculum scan of each of the faculties by the coordination team, they produced a report detailing which competences are already covered within the curriculum, and where gaps have been identified. The areas of strength and potential for future improvement will be presented to the faculties. From there, the staff and coordination team may collaboratively validate the accuracy of the scan and develop a **faculty-specific plan for future action**.

In addition, this phase involves assessing how the competences are complementary to programme management more generally (touching on how the competences can be implemented in the day-to-day high level work at different faculties, in addition to the disciplines themselves). The coordinators also sought to identify competences which were not yet implemented or otherwise visible in the everyday academic context. Subsequently, they sought to learn how adjustments can be made to address these.

At the moment, the project team has identified a gap in specificity between the high-level competences (e.g., supporting fairness, exploratory thinking) and the more detailed Knowledge, Skills and Attitudes (KSA) statements (as presented in the Appendix 2 of GreenComp). It is noted that the high-level elements, such as 'Embodying sustainability values' (Green Comp framework, Section 4.1) are highly transferable and mobilizable for a wide range of purposes. The deemed risk is that the generic nature leaves these elements vulnerable to support areas and actions which are, in fact, misaligned with the sustainability goals, such as profit-maximisation. For instance, out of context, Collective action (Area 4, Competence 4.2) can be leveraged for any type of initiative (including ones counter to sustainability goals), while it can be claimed that the initiative is thus aligned with the GreenComp framework.

Phase 2: Roadmap Development

Based on the scan, the coordinators will produce the '**Roadmap GreenComp@OU**', a comprehensive overarching report detailing a range of existing good practices per competency, appropriate interventions to further the competences at the OU, and a more general overview of tools and instruments for sustainability at HEIs. This roadmap will subsequently be available for all teachers at the HEI to determine how to implement the competences in their course leading and training activities moving forward.

The coordinators also envision **workshops and events** in collaboration with the Green Office to communicate the project outputs internally. In the long run, the coordination envisions the findings from the present initiative informing the development of a sustainability report for the OU; an output which is presently not standardised at all HEIs in the Netherlands.

An **adaptation of the competences is envisioned for each OU faculty** in order to reach increased sustainability (i.e., align research, teaching and degree management with more competences than thus far) at faculty and institutional level. This initiative thus aims to produce a tailored plan which describes appropriate adjustments for each faculty. Rather than using the full framework for all disciplines uniformly, the **framework is treated as a malleable template adapted for each discipline**. The adapted versions of the framework and competences are used to analyse elements like learning outcomes, course contents and grading structures to identify areas for future improvements.

There was a **collective sense** from the faculties that an additional step in bridging the competences to the realities of managing higher education programmes would be needed. Drawing on the KSA statements in Appendix 2, questions were raised about the extent of common ground between the statements and disciplines (e.g. how systems thinking links with psychology). As such, there was concern about barriers and bottlenecks involved in implementing the competences. In addition, it was noted that, as a whole, **the framework is situated in a highly specific space, particularly in terms of value-based assumptions**. Although individual elements may already be in frequent practice (e.g. critical thinking), the overarching framework may be challenging to translate to fields like business ethics or medical sciences. For example, identifying possibilities to apply political agency and its KSA statements at the department of clinical psychology may be less straightforward. A risk was identified pertaining to the motivation to follow through, where it was deemed that competences (or KSA statements) were not aligned with the objectives or perspectives of the disciplines. What this means is that if the framework, as an entity, appeared overly misaligned, striving to meet the competences may be abandoned altogether. For this reason, it was hoped that more work was carried out to identify accommodating ways to bridge the competences for different fields of research and teaching. Engaging all areas of research (from STEM to humanities) in the development and design of GreenComp or similar frameworks could be fruitful in integrating sustainability practices successfully in different faculties at HEIs.

3 The context - enabling conditions and challenges

There are a few particular contextual enablers supporting the success of this kind of initiative. Firstly, establishing the initiative as part of a **wider institutional programme** (i.e., as part of the quality assurance framework at the OU) has ensured that the HEI, as a whole, has invested budget and researcher capacity across its full spectrum. As such, it also established a mandate for all faculties to engage with the initiative.

Moreover, the background and orientation of the **project leaders**, as well as the context of the initiative all serve as considerable enablers in the process. The initiative is led by researchers specialised in the topic of sustainability in institutional contexts. The coordinators are extensively familiar with the larger series of JRC-produced frameworks, and thus, able to review GreenComp as part of a greater output from the European Commission.
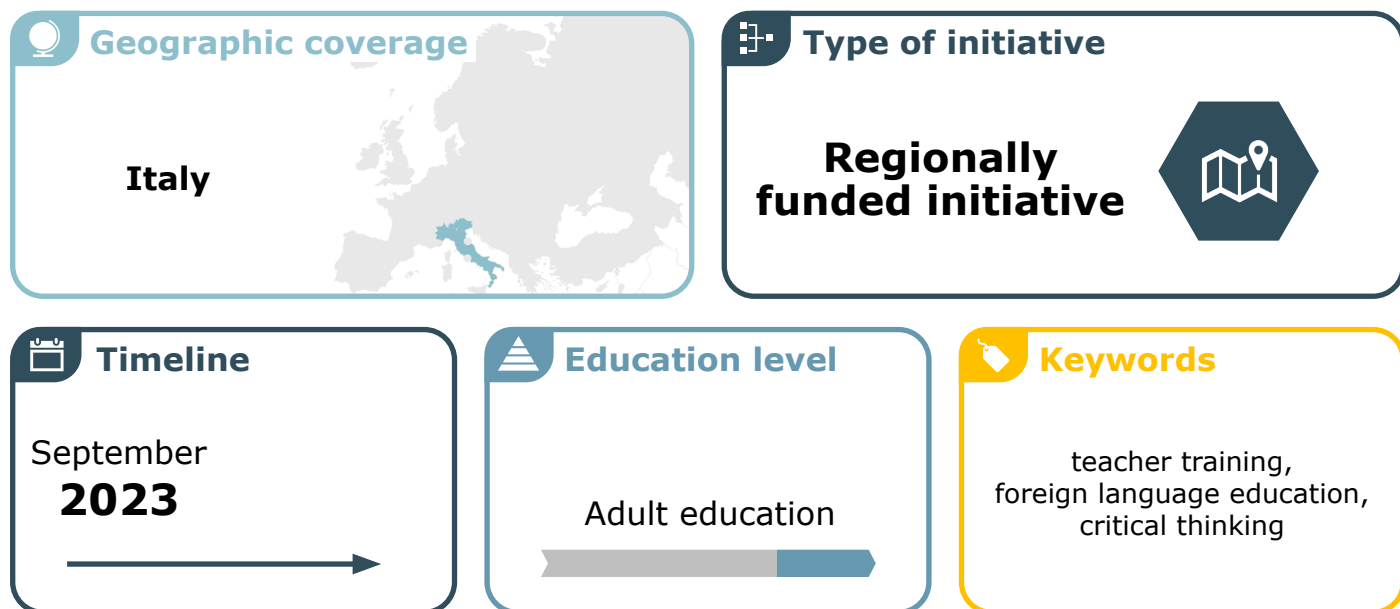
4 Leasons learnt and recommendations

The present initiative presents an in-depth multi-disciplinary effort to understand how the GreenComp framework may best serve different disciplines and/or individual institutions. Moreover, as summarised above, the work thus far has made strides in identifying areas of future work. The initiative interrogates GreenComp for its viability and transferability in a range of contexts. Although this involves the critical assessment of the framework, it also works to formulate a version which can inform decision-making in the future.

An emerging key reflection is that the GreenComp framework and competences can, and should, be interpreted and applied in a way which works for the target audience. Through this initiative, we understand that, while GreenComp offers a robust framework informing approaches and action, it may not be compatible with the needs and priorities of different target groups depending on their general objectives and goals. It would, therefore, be valuable to invest time and funds in exploring what sustainability goals would look like to various audiences in terms of feasibility and relevance.

Greening the English classroom
by making sustainability "visible"

Geographic coverage

Italy

Type of initiative

Regionally funded initiative

Timeline

September
2023

Education level

Adult education

Keywords

teacher training,
foreign language education,
critical thinking

1 Overview of the case study

Target groups

The aim of this case study is to showcase an instance of deploying the GreenComp framework as a **bottom-up initiative** for a specific event for **foreign language teachers** in the autonomous province of Trento in Italy. The initiative titled Sguardi e riflessioni sull'educazione linguistica[1] was a three-day long teacher training event for foreign language teachers that took place between the 27th-29th September 2023. It was organised in recognition of the annual European Day of Languages. The event was established as a space for **reflection and debate on the latest innovations and current topics in language education.**

It included an online **training session** in the form of a **webinar on the GreenComp framework** entitled: 'Greening the English Classroom by making sustainability "visible".[2] The UNESCO Framework for the implementation of Education for Sustainable Development[3] was also considered for the development of the training, upon researching the two comparatively, GreenComp provided a better fit with its holistic approach to sustainability and consistent packaging.

The **aim** of the online training session was to help teachers develop sustainability-related lessons by providing ideas on how to **engage learners** to **develop their English skills** while also raising their **awareness of sustainability-related** issues.[4]

Stakeholders

The initiative was centrally coordinated by the **Provincial Institute for Educational Research and Experimentation, IPRASE**. IPRASE is a regional agency in Trento with dedicated funding for teaching and innovation-focused activities. Having said this, the initiative was organised by teachers and for teachers entirely. IPRASE invited

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1   Italian for 'Views and reflections on language education'
2   The webinar was developed by Anna Raneri, teacher trainer
3   www.unesco.org/en/sustainable-development/education
4   www.iprase.tn.it/documents/20178/10272291/Sguardi+e+riflessioni+sull%27educazione+linguistica_Programma.pdf/8ff29fe9-24b3-4e54-b249-efd04684d420

teachers and teacher trainers to develop a set of seminars and webinars for the three-day event, which was organised part in person and part online.[5]

2 The use of GreenComp

The short online training session used the **GreenComp competences** in a series of **interactive** and **visual sustainability scenarios** to showcase participants how to embed sustainability-related issues in their lessons while creating connections to their local environment.

The webinar introducing GreenComp promoted both **sustainability ideas** as well as **pedagogical elements from GreenComp**. These focused on **collaboration** and **critical thinking** while demonstrating ways to integrate these competences in English language development. The webinar shared the framework along with further training resources for attending teachers.

Participants of the training event were predisposed to being open to novel approaches as the three day-long event was focused on innovative teaching approaches, and thus, receptive to learning about GreenComp. Attending language teachers learnt about the GreenComp framework for the first time and showed considerable interest. This gave a boost to further distribution of the webinar materials in later training events.

While the framework was not explicitly present in all subsequent materials, its influences had become an intrinsic part of disseminated training materials. Moreover, sustainability as a topic was kept systematically and carried over for the planning of future training initiatives.

3 Leasons learnt and recommendations

The initiative was fairly small in scale, it concerned a **one-off event** in which GreenComp was presented to practitioners in the same field. The high volume of reported interest supports the **viability of introducing GreenComp in seminar contexts**. It also demonstrated that the framework can be **adapted to a specialised context**, in this case language teaching specifically.

There were several positive elements about GreenComp which were commended. Its **sound evidence base**, **transparent referencing to further sources**, as well as a **definition of sustainability** which enjoys a widespread consensus, all made the framework uniquely appealing. The **competences** were also mentioned specifically as valuable resources and, supported by the **visualisation used,** were found to support transferability in a pedagogical context.

The only reported challenge in GreenComp was its **complexity** and the **time requirement for implementation**. The competence framework needs to be studied for one to be able to identify key areas of use. The **universality of the framework** meant that time investment is needed in adjusting the contents to classroom objectives.

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5   www.iprase.tn.it/formazione/dettaglio-iniziative?corsoId=28123

GreenSCENT
Smart Citizen Education for a Green Future

GREEN
SCENT
SMART CITIZEN EDUCATION
FOR A GREEN FUTURE

Geographic coverage

Italy, Spain, France, Denmark, Greece, Finland, Serbia, Austria, Romania

Type of initiative

Horizon 2020 project

20 20

Timeline

January
2022
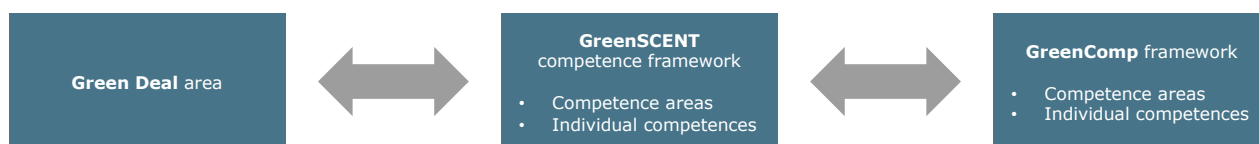
December
2024

Education level

All levels

Keywords

Green Deal, green and digital skills, behaviorial change, competence framework, training materials, certification

1 Overview of the case study

The three years long GreenSCENT project, short for "Smart Citizen Education for a Green Future" is a H2020 project[1] that aims at generating awareness and behavioural change in relation to the topics addressed in the Green Deal.

GreenSCENT, as a project, explores a wide range of pedagogical activities in urban and rural areas and across different social and geographical contexts. Underpinning the whole project, is the **development of the GreenSCENT competence framework**. As highlighted in the second section of this case study, the GreenSCENT framework is based on the GreenComp and develops it at a higher level of granularity, matching the Green Deal areas.

Green Deal area		**GreenSCENT** competence framework • Competence areas • Individual competences		**GreenComp** framework • Competence areas • Individual competences

The development of the GreenSCENT Competence framework, is accompanied by a set of activities aimed at applying it in real educational settings. This is done through:

- The use of **hybrid and digital technologies** to help students from primary and secondary schools as well as universities, to **change their behaviours** and address the challenges identified in the Green Deal, applying the competences identified in the GreenSCENT This involves breaking stereotypes, changing sceptical attitudes, and increasing awareness among pupils, students, and society through inclusive and accessible citizen science and co-creation approaches.

- The co-creation of **training kits**, user guides, and **use cases**, develop courses, develop curriculum, and create Green Deal certification programmes, around the GreenSCENT

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1   https://cordis.europa.eu/project/id/101036480

competence framework.

- Outreach, dissemination, clustering, and exploitation activities aimed at maximising the impact of GreenSCENT.

Stakeholders

The **project consortium** is composed of universities, schools, private companies (SMEs), including Serbian partners as non-EU members.

Figure 17 Members of GreenSCENT consortium

• Uninettuno – Rome, Italy	• ECQA- European Certification and Qualification Association, Austria CRA – Climate Risk Analysis
• ENG – Engineering – Ingegneria Informatica SPA , Italy	
• UAB – Universitat Autònoma de Barcelona, Spain	• EA – Ellinogermaniki Agogi Scholi Panagea Savva AE – Greece
• BSC – Barcelona Super Computing Centre, Spain	• MAYK – Maunula Secondary School and Helsinki School of Mathematics – Finland
• AGORIZE – France	• RST – Royal School of Transilvania – Romania
• VTT – Finland DBT – Denmark	• RGSMART – Racunaraska Gimnazija Smart Novi Sad, Serbia
• 4S – 4Sfera Barcelona	
• UNSPMF – University of Novi Sad Faculty of Sciences, Serbia	• CSR Company International – CSR Company International

The schools in the consortium provide the testing and learning ground for all the activities of the project; universities and companies provide scientific methodologies and the technological tools needed for the activities. The long-term objective is, however, to reach beyond the schools and pupils of the consortium and develop tools and materials that can be easily adopted and adapted by the educational community at large.

Main results and deliverables

The project is implemented in three phases[2] and will finish at the end of 2024. The main **results and outputs** include:

- The GreenSCENT competence framework;

- Website and tools (digital demonstrators, platform, AR), including immersive platforms, offering immersive videos and photos and reconstruction of interactive scenarios;

- ScentBox, which will include a set of open-access tools and applications aimed at instilling green skills in young European citizens, coming from the consortium organizations and ranging from 15 to 25 years–old;[3]

- ECCEL - European Certification for Climate and Environmental Literacy. The certification represents one of the main goals for the long-term future of the project, allowing validation of the competences taught and especially the constant improvement and update of it;

- Policy recommendations addressed to Member States as well as to the EU level on how to improve education on green competences.

The final publication will outline the main results of the project, especially in terms of awareness and values raised among the pupils. The results will be monitored and reviewed to evaluate how the different piloting and educational activities are linked to the different competences (GreenComp and GreenSCENT).

As the project is currently still ongoing, **there is currently no publication articulating the correspondence between GreenComp and GreenSCENT**. In the section below we

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2   www.green-scent.eu/about/methodology/
3   These are a set of open-access tools applications aimed at instilling green skills in young European citizens.

reconstruct the correspondence between the two, with selected examples. The full description of the linkage between the two competence frameworks will be provided in the GreenSCENT final report. The latter will also indicate some follow-up activities envisaged after the conclusion of the project.

2 The use of GreenComp

The GreenSCENT framework (i.e. GreenSCENT Comp) has clear ties to GreenComp. The project was financed under the H2020-EU 3.5 programme SOCIETAL CHALLENGES - Climate action, Environment, Resource Efficiency and Raw Materials,[4] under the topic *Enabling citizens to act on climate change, for sustainable development and environmental protection through education, citizen science, observation initiatives, and civic engagement*, which focuses on the creation of competence framework on the Green Deal themes. **The principles and values that gave impetus to GreenSCENT are the same as those underpinning the GreenComp framework.**

Moreover, the starting phase of GreenSCENT coincides with the publication of the GreenComp framework, therefore GreenSCENT is one of the early projects that took into account the GreenComp competence framework.

The GreenSCENT competence framework integrates both the eight Green Deal thematic areas and the GreenComp framework, in a correspondence matrix, as described below.

To understand how the GreenDeal, GreenComp and GreenScent are matched, it is important to notice that GreenSCENT is articulated in *Competence Areas* and *Individual Competences* within each *Area*. For each of the eight Green Deal themes a set of GreenSCENT Competence Areas are identified (ranging from three to seven). In turn each of those, branches out into individual competences. The matching with GreenComp occurs at the level of the individual competence, hence the network of interrelations is complex. The tables below exemplify such matching. It indicates how the Green Deal areas are first articulated in broad GreenSCENT competence areas.

Figure 18 Green Deal Areas and the corresponding *competence* areas as outlined by GreenS-CENT

Green Deal area	**GreenSCENT** competence areas
Biodiversity	1. Biologically diverse ecosystems values
	2. Embracing experimental learning
	3. Ecosystems literacy
	4. Psychological aspects for behavioural change
	5. Nature restoration goals
	6. Enabling transformative change
Circular Economy	1. Understanding
	2. Stakeholder engagement
	3. Challenges
	4. Communication
	5. Circular Design and Technology
Clean Energy	1. Understanding the Challenge
	2. Embodying Clean Energy
	3. Industry, Employment, Finance

Climate Change	1. Climate Science and Practice Literacy
	2. Climate Change Adaptation Leadership
	3. Interdisciplinary communication boosting
	4. Understanding the Challenge
	5. Climate adaptation reaction
	6. Smart and fast adaptation
	7. Systemics adaptation economy and society
From farm to Fork	1. Sustainable food production
	2. Sustainable food processing and distribution
	3. Sustainable food consumption
	4. Food loss and waste prevention
Green Building	1. Green building, general competences
	2. Green building material and resources
	3. Green building products and technologies
	4. Green building, part in economy
Smart Mobility	1. Embodying sustainability
	2. Awareness
	3. Take action
Zero Pollution	1. Understanding the Challenge (ZP)
	2. Embodying Zero Pollution (ZP)
	3. Industry, Employment, Finance (ZP)

The next table shows, for the Competence Area C1. Biologically diverse ecosystems values, its articulation and correspondence to the GreenComp framework.[5]

Figure 19 GreenSCENT and GreenComp correspondence in C1. Biologically diverse ecosystems values

GreenSCENT competences	**GreenComp** competences
Biodiversity 1.1 Deal with uncertainty in the context of biodiversity loss	1.1 GreenComp- Valuing sustainability
	1.3 GreenComp - Promoting nature
	4.1 GreenComp - Political agency
Biodiversity 1.2 Open-minded perception towards living species on Land	1.1 GreenComp- Valuing sustainability
	1.3 GreenComp - Promoting nature
	2.1 GreenComp - Systems thinking
	2.3 GreenComp - Problem framing
	3.1 GreenComp - Futures literacy
	4.2 GreenComp - Collective action
	4.3 GreenComp - Individual initiative
Biodiversity 1.3 Capacity to one-self motivation in sustaining a thriving ecosystem	1.1 GreenComp - Valuing sustainabili ty
	1.3 GreenComp - Promoting nature
	4.1 GreenComp - Political agency

Source: Technopolis Group

5   The link between GreenSCENT and GreenComp, is also mapped into a so-called "Knowledge Graph". The mapping between GreenComp and GreenSCENT serves as a conceptual framework that enables reflection on the utilisation of GreenComp for the purposes of this case study. It should be stressed, however, that such reflection is not actively pursued within the GreenSCENT project as such.

As part of the project, a set of educational initiatives are also devised to help students acquire various sustainability competences.

Example 1: CleanAir@School[6] is an initiative launched in May 2022 within the GreenSCENT project. Its main objectives are to "enhance students understanding of air pollution" and to raise awareness among the participants on air quality issues, driving them to adopt more sustainable attitudes and habits, especially concerning mobility. Through specific sensors (called passive samplers) placed by the pupils, students from 12 elementary schools in Girona (ES) monitored air pollution in and near schools and their surrounding areas, for four weeks. After this timeline, more than 150 sensors spread across the city were collected to be analysed in an accredited laboratory.

Relevant **GreenComp competences**: *1.1 Valuing sustainability*, by assessing air pollution in their school environment and *2.1 Systems thinking* by looking at how it affects their quality of life in different ambiances.

Example 2: Micro-plastics in the Ocean - On May 2023, one of the GreenSCENT activity included the involvement of around 30 students from a school in Cardedeu (ES) to observe, analyse and assess the impact of microplastics in Catalonia's beaches. The analysis was done through sampling spots taken across various areas of the beach and by gathering small sand samples. Finally, from the sand collected, the students separated the microplastics present in the samples. On the one hand, the sand was "cleaned" from the microplastics thus making the beaches less polluted. On the other hand, the plastic separated from the samples was reused to create sculptures by the pupils afterwards.

Relevant **GreenComp competences**: *1.1 Valuing sustainability* and *2.1 Systems thinking* by looking at the presence of microplastics in the sea and by developing creative solutions to re-use them (circularity).

Example 3: From October 2022 to January 2024 GreenSCENT implemented four **Youth Assemblies**[7] with 56 young people (between 15 and 25 years old).. Participants come from both EU and non-EU countries (seven in total: Denmark, Finland, Greece, Italy, Romania, Serbia, and Spain). In online workshops participants co-developed "tools and processes […] and generate ideas and suggestions for the design and implementation of these tools in educational settings.

Relevant **GreenComp competences**: 1.1 *Valuing sustainability*, 2.1 *Systems thinking*, 2.2 *Critical thinking*, 3.3 *Exploratory thinking*.

3 The context - enabling conditions and challenges

The initiatives and tools developed within GreenSCENT, and putting into practice the Green SCENT competence framework, are designed to transcend national or local boundaries, enabling application across a diverse array of countries and environments, including urban and rural settings. The GreenSCENT website has a dedicated page for tools and resources including: a toolkit for green storytelling for children; a YouTube channel with project outputs and educational resources. The repository of resources is still at a preliminary stage as the project is not yet completed. The project partners anticipate that **replicability and scalability** are going to be **challenging**. While the challenges identified below are for GreenSCENT, they might provide insight for GreenComp as well. More specifically **inclusion, down-scalability, replicability** and **contextualisation** are critical.

Inclusion: The GreenSCENT consortium includes four schools, of which three are private and considered "elite" schools. In other words, the experimentation of educational practices took place in an economically and socially privileged environment, potentially positively oriented towards environmental issues. It was therefore necessary to construct and implement a **research protocol** for "external pilots", to reach out to less privileged environments. To this aim, a set of instructional co-design workshops were designed with local teachers in rural Romania, as well as suburbs of Rome (Italy) and in Spain through the UAB and their Summer Schools activities for students risking university exclusion. The workshops focussed on the accessibility of the digital resources produced by the project, and on the involvement of vulnerable groups in project activities. The limited time available, the lack of financial means,

6   www.green-scent.eu/cleanairschool/
7   www.green-scent.eu/youth-assemblies/

technological resources, limited digital coverage (especially in rural areas) and the limited background knowledge about sustainability and competence frameworks (both GreenSCENT and GreenComp) posed significant challenges to implement the activities foreseen in GreenScent. Secondary school teachers required adequate training (kits prepared and tailored to them), indicating that accommodating a competence approach to teaching, in sustainability, is far from easy.

Down-scalability: While the project envisaged the use of innovative pedagogies enabled by digital technologies, in some contexts, the implementation of the project revealed that resources (background knowledge, connection, device availability and especially lack of time available) are not always available for these goals. In order to ensure the replication of educational activities in different socio-economic-cultural contexts, GreenSCENT developed initiatives across different scenarios (high-resources and low-resources), in order to scale down the technological requirements to activities based on paper prototypes. An example of the former is the tool case of the development of interactive documentaries *GreenVerse*. An example of the latter is the development of tools to study "micro-plastics" which is almost entirely analogue (and therefore needs to be implemented in proximity to the sea as opposed to remotely). The need to adjust to high and low resources scenarios, is likely to be relevant also in other activities implementing GreenComp.

Trade-off between readiness and contextualisation of tools: the balance between an easy-to-adopt/ready-to-use tool/activity and a contextualised/customised one, is difficult to strike. The experience of GreenSCENT suggests that it is difficult to quickly transfer the knowledge implicit in the GreenSCENT approach. Indeed, acquiring the ability to teach through a competence-based method (be it GreenSCENT or GreenComp) requires time and resources that are not always available. It is for this reason that GreenSCENT is trying to provide a heterogeneous range of possible teaching activities, producing a series of materials complementary to the competence framework, to make it as easy as possible to choose tools and scenarios suited to the contexts and resources available.
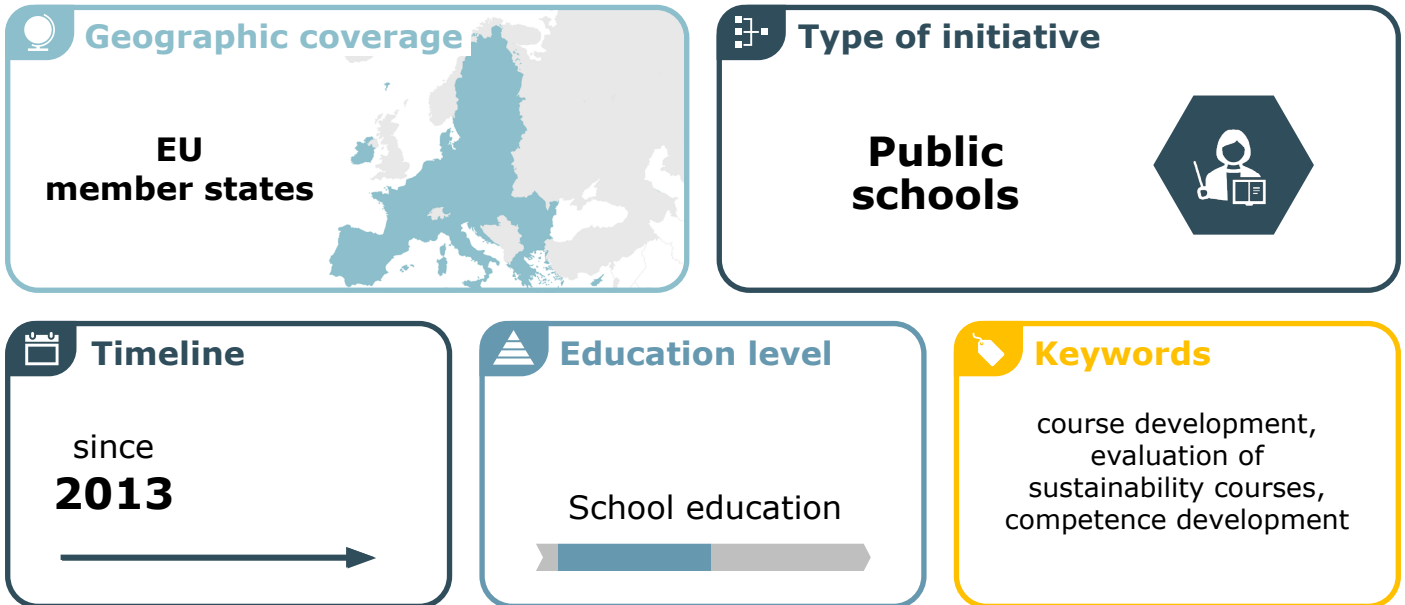
4 Leasons learnt and recommendations

This case study focussed on the H2020 project GreenSCENT, with the aim to extract lessons for the GreenComp framework as both are aimed at supporting competence-based sustainability education.

Competence-based sustainability education is **complex to develop and apply**. Challenges emerge when trying to adopt competence-based approaches across different environments, depending on the level of digitalisation, specific characteristics and the socio-economic context. Any tool or initiative **needs to be adapted to the specificities of each educational environment**, which is costly in terms of time and resources. Nevertheless, while competence-based sustainability education presents its challenges, its significance cannot be overstated. Adapting competence-based approaches to different scenarios is imperative for fostering a sustainable future.

Case Study

Education for Sustainable Development
in the
European School System

Geographic coverage

**EU
member states**

Type of initiative

**Public
schools**

Timeline

since
2013

Education level

School education

Keywords

course development,
evaluation of
sustainability courses,
competence development

1 Overview of the case study

The European Schools and the Accredited European Schools are educational institutions set up in the European Union's Member States.[1] They provide children and young students with a multilingual and multicultural education at nursery, primary and secondary levels.

The schools follow a specific curriculum and offer the European Baccalaureate diploma. The European Schools initiative began in 1953 in Luxembourg, expanding to 13 schools across six countries. Since 2005, they have opened their curricula to national schools, leading to the emergence of 24 Accredited European Schools, with more planned for the future.

European Schools primarily cater for a community of children of employees from EU institutions, therefore they attract pupils from diverse international background and with a heightened awareness of socio-political issues. As such, their interest in sustainability and the competences to support a transition to a more environmentally friendly planet, long preceded the development of the GreenComp Framework.

In the European Schools, **teaching and learning are competence-based,** emphasising several didactic principles, such as *cross-curricular integration*, *active-learning* and *differentiation.* These principles are implemented through a variety of teaching and learning methods, strategies, and activities, which have been adapted also to educational activities related to sustainability.

The European Schools System has embraced the educational focus on environmental sustainability[2] in line with the European Green Deal, and education for sustainable development (ESD) has emerged within the European Schools System (ESS) framework. There has been a growing recognition and commitment to advancing sustainable education practices, and an **ESD working group** was founded in 2013.

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1   Currently there are 13 European Schools in 6 Members States and 24 Accredited European Schools in 14 Member States. See here for further information: https://www.eursc.eu

2   www.eursc.eu/Documents/EP%20PE699_647_European_Schools_System_study.pdf

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ESD-related topics and initiatives are gaining traction across individual schools, in the classroom and in extracurricular activities. Schools are increasingly incorporating additional learning modules and strive to make activities more environmentally friendly. Operational spill-over effects of ESD include heightened attention to sustainability in school operations, spurred by initiatives such as the Eco-Schools.[3] Schools are adopting sustainable practices in some of their daily operations, driven by student pressure and initiatives like the installation of solar panels (ibid.).

Additionally, **selected initiatives** educating students towards topics linked to sustainability and climate awareness are already in place. Examples of good practices include the Sustainable Innovative School project at ES Luxembourg and the Green School strategy at ES Varese. While challenges remain, the ESS makes proactive efforts to promote sustainability within in the schools and beyond also by engaging the parent body. Parents are actively involved in school activities for example by being in charge of transport, canteen services or extracurricular activities. Running these services, they have an important role to play as drivers for change, e.g. through introducing electric buses or sustainable food options, and contributing to the schools' wider sustainability goals.

The pedagogy of European Schools and the diverse backgrounds of their students and their families make the European Schools a relatively easier environment in which to apply **the GreenComp framework** and foster education for sustainability. The initial steps are already underway, even if **challenges remain** to a more comprehensive integration of ESD into the curriculum and daily operations across the ESS. In this case study we explore, **how the ESS used GreenComp** to advance some of their activities.

2 The use of GreenComp

To showcase the use of GreenComp in the ESS, we focus on two initiatives:

- A basic **foundation course** that prepares pupils for university and
- A **specialised course**, that specifically targets students aspiring to a career in sustainability.

Figure 20 The GreenComp Framework in the ESS

| **Foundation course** - Science Technology and Society | → | **Specialised course** - Sustainability and Active Citizenship |

The foundation course on Science, Technology, and Society

European Schools have developed a course catering for secondary students in the last two years of schooling (15/16-17/18 years old). The 2-period "Science, Technology, and Society (STS)" course takes a multidisciplinary and cross-curricular approach, and is mandatory for students not specialising in higher level science. The course aims at developing **general competencies and critical thinking skills**. It emphasizes the development of a broad understanding of science and environmental topics for all students. Whilst there is no explicit reference to the GreenComp framework, the course is inspired by the same pedagogical and environmental principles underpinning GreenComp.

The course on Sustainability and Active Citizenship

The ESS has also developed and implemented a course on "Sustainability and Active Citizenship" aimed at preparing 16-17-year-old students for university pathways in the field of sustainability, with a focus on active engagement and social change.

The **syllabus explicitly cites the GreenComp framework** as a key institutional reference. The course unfolds over two years, beginning with a conceptual foundation, where students delve into core sustainability and climate change concepts, then move towards an active

3   Eco-Schools is a global education programme that teaches children in school about pressing and urgent environmental problems. Eco-School uses participatory methodologies to empower and inspire pupils to learn about the environment and sustainable development.

citizenship phase, where the focus is on empowerment. In the second phase, the pupils engage in active citizenship projects at local and global levels, applying their knowledge and skills to real-world challenges. Throughout the programme, emphasis is placed on cross-curricular integration, aiming at a holistic understanding of sustainability issues and their multifaceted implications. The course promotes open conversations and fosters a culture of innovation and collaboration. Its ultimate goal is to equip students with the tools and mindset necessary to become informed, empowered citizens committed to effecting positive change in their communities and beyond. This course offers a comprehensive exploration of global environmental, climate and sustainability issues. It is open to all students without prerequisites and provides a solid background in environmental and sustainability studies. Ideal for those interested in pursuing further education in sustainability and the green transition, the course focuses on systemic, prospective, and collective approaches to sustainability challenges. The syllabus was developed by a dedicated working group, taking stock of the experience of the Climate Academy programme (see Box 1 *The Climate Academy - Independent Extra Curricular Activity in the ES Woluwe*) and in cooperation with the Joint Research Center and the European Patent Office. **The course is currently available in five schools in the network** and will be extended to all European Schools in September 2024.

GreenComp is implicitly embedded throughout the syllabus with its focus on pro-active engagement, and it explicitly frames the evaluation grid. As shown in the table below, each of the GreenComp competences in the left column has a specific and **unique evaluation criterion**, applied at the end of the project. **Following the validation process** from the community of experts, **the rubric will be adapted** and then presented to the internal competent committee of the European Schools. After further adaptation based on the feedback of the committee, it is expected to **initiate a piloting phase** within the schools. The **end product** is expected to be a **public and adaptable rubric** that will be available for all school leaders in Europe to use and adjust to their needs.

Figure 21 The assessment of the course Sustainability and Active Citizenship: suggested evaluation criteria for each of the GreenComp competences

6.3 Suggested assessment rubric for the end-of-year project in s7

COMPETENCES ASSESSED	EVALUATION CRITERIA
Embodying sustainable values	
• Questioning value systems, from the individual to the universal	Personal and cultural perspectives are considered through cognitive biases.
• Integrating the need for equity and social justice	The main societal issues are known.
• Assessing the individual and collective value of changes	The diversity of individuals, cultures and societies is considered.
Integrating complexity into sustainability	
• Defining and characterising systems thinking	Problems are reformulated in a global approach.
• Identify the structural and functional aspects of a system	The components of a system and the interactions that make it work are identified.
• Formulate problems in a global vision	Cognitive blocks to understanding systems thinking are identified.
Imagining a sustainable future world	
• Defining the effectiveness and resilience of a strategy	Actions are analysed according to their ability to withstand disturbances.
• Understanding the concepts of mitigation, adaptation and transformation	The characteristics and limits of each concept are clearly identified.
• Develop and arbitrate continuity or breakdown scenarios	A critical look at the proposed solutions.
Acting for a sustainable world	
• Engage in action according to degree of responsibility and power	Participation in debates.
• Identify the obstacles and levers for individual or collective change	The scale of action is appropriate to the problem being addressed.
• Be aware of your individual and collective responsibility	Ability to define the issues, aims and means of individual and collective actions.

Source: www.eursc.eu/Syllabuses/2023-01-D-28-en-2.pdf

In addition to these courses, further extra-curricular activities are also taken up by the ESS from the offer of the Climate Academy, an out-of-school programme first created at the European
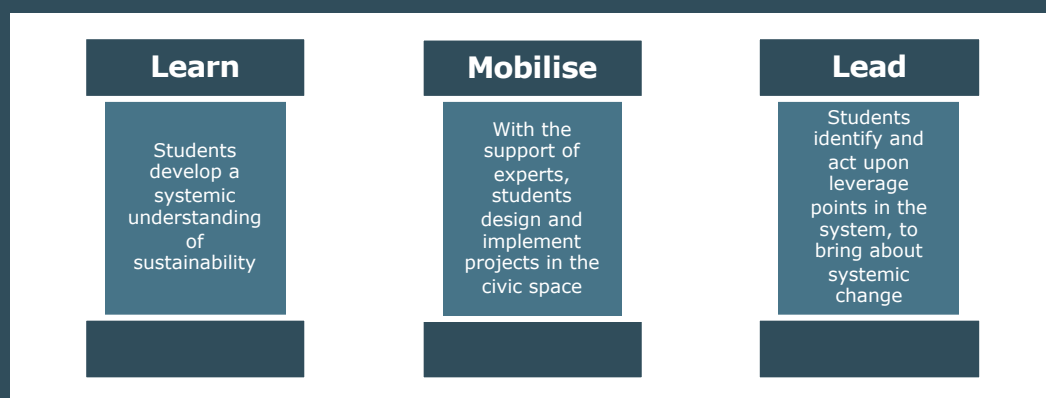
School Brussels II, then established as a non-profit organisation.[4]

Box 1 The Climate Academy - Independent Extra Curricular Activity in the ESS

The Climate Academy provides extra-curricular programmes for students and schools including the European Schools. The Academy aims at educating students in global environment issues and on the climate crisis in a horizontal and transversal way.

The Climate Academy fosters an action-oriented approach to learning, founded on systemic understanding of both scientific and social issues underpinning sustainability. The Climate Academy precedes the GreenComp Framework in time, but its three pillars show a lot of similarities to the GreenComp framework, as summarised in the image below.

Figure 22 The three pillars of the Climate Academy[5]

Learn

Students develop a systemic understanding of sustainability

Mobilise

With the support of experts, students design and implement projects in the civic space

Lead

Students identify and act upon leverage points in the system, to bring about systemic change

3 The context - enabling conditions and challenges

European Schools have for some time demonstrated interest in incorporating sustainability into their teaching approach as described before. Despite this fertile ground, and notwithstanding the positive reception and projection of educational activities grounded in sustainability and benefiting from the GreenComp framework, several challenges are emerging in relation to the diffusion of the approaches currently implemented in the European School System:

1. **Training for Teachers:** A significant challenge lies in providing formal training for teachers to effectively implement initiatives related to sustainability, based on principles aligned with the GreenComp framework. The open-ended nature of these educational initiatives, with a focus on self-agency and active citizenship, necessitates tailored training programmes. As such, the diffusion of courses such as "Sustainability and Active Citizenship" – currently available only in 5 schools of the network – requires time and investment including having more trained teachers across all fields.

2. **Visibility and Recognition:** Enhancing the visibility of the courses and the competence-based approach is imperative. Formal certification and recognition mechanisms are essential for ensuring credits for green competences and promoting the diffusion of curricula within and beyond the school network. However, efforts are still required to ensure that adequate certification mechanisms are in place.

3. **Language Barrier:** The language barrier presents a notable challenge for wider educational contexts. Whilst language barriers can be overcome within the network of schools itself,

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4   https://theclimateacademy.org
5   https://theclimateacademy.org/the-3-pillars

they become paramount when interactive with stakeholders at the national level, hindering the replicability of the initiatives themselves.

4 Leasons learnt and recommendations

The initiatives described in this case study are at the early stages of implementation, therefore, it is not yet possible to devise solid recommendations regarding similar use of the GreenComp framework. Nevertheless, it is important to notice that, despite the different scope of the initiatives the challenges faced are similar. They highlight that adapting and diffusing the GreenComp to the general educational communities across Member States is likely to be challenging for reasons related to both capacities and culture. Embracing a competence-based approach requires time, resources and adaptation to the specific educational context.

As the ESS is, in many ways, pioneering initiatives related to the GreenComp, it seems important to revisit them to better understand the progress achieved and the way they manage to overcome some of their challenges. Further research should explore the pedagogical offer from the students' perspectives, to understand the processes through which activities and options are chosen within the rich curriculum and the demands of the ESS.

Embedding GreenComp

in national strategies and teacher training activities

Geographic coverage

France, Finland

Type of initiative

Regional/ national initiative

Timeline

France: since **2023**

Finland: **2022** → **2024**

Education level

School education

Keywords

education for sustainable development, sustainable pedagogy

1 Overview of the case study

This case study presents a **comparative review** of two instances where the **GreenComp framework has been deployed** in two European contexts. One of the initiatives is a **regional sustainability pedagogy project in the Finnish city of Oulu**, part of a national programme that integrates sustainability principles and practices into primary and secondary teaching in Finland.The other initiative is the **French Education for Sustainable Development** (ESD) competence framework by the French Ministry of Education and Youth.

Finland

In Finland, the national programme, 'Initiative to develop sustainable pedagogy', and the regional 'Opinvirta'[1] initiative, aim to **integrate the sustainable education agenda** into the pedagogical and teaching sector for primary and secondary education in the City of Oulu and the country at large. The Finnish Ministry for Education and Culture allocated **€5m** to be distributed by the national initiative to regional and local projects. The regional initiatives have run across the country from 2022 to the spring of 2024. Between the national and regional initiatives in Finland, the following **main phases** have taken place, or are taking place:

- At the **start of the initiative in 2021**, the coordination team conducted an assessment of the state-of play of sustainability in education in the country and established a common understanding around sustainable pedagogy and related concepts. This involved consulting academia and numerous

Figure 23 Distribution of the national funding initiative across Finnish regions

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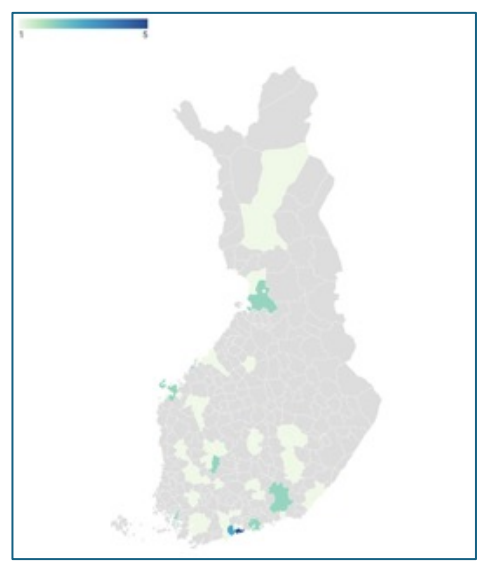
1 Opinvirta is Finnish for a 'stream of learning'

stakeholder groups. GreenComp became especially valuable in this process as a central resource in harmonising key concepts across Finland.

- Next, the coordination group distributed €5m in governmental funding to **regional authorities and private education institutions** to further the sustainable pedagogy principles in practice and professional culture. Out of the total portfolio of about 70 initiatives, data is available on 58 which received €4.2m of the overall pot.[2] The single largest share of funding, €243,000 was awarded to Opinvirta, while the mean award was approximately €72,000. The 58 projects took place across 43 cities, towns and municipalities visualised in the featured figure. The projects varied considerably in scale and ambition, from a school-based community garden to regional policy development initiatives. Once the projects are completed in May 2024, the National Agency for Education intends to run an impact assessment to understand their effects.

- The **Opinvirta** initiative seeks to transform learning and teaching by embedding **sustainability principles** as a guiding force in **all decision-making in schools**. The City of Oulu, the recipient of funding for Opinvirta, proposed to build on a previous project to embed environmental awareness in schools. In collaboration with six schools in the North Ostrobothnia region, the project seeks to develop a bespoke roadmap to sustainability for secondary schools. Additionally, to incentivise skills development and sustainability action, the project seeks to develop **specialised credits** for secondary school students to utilise in their application for HEIs.

The national and regional initiatives in Finland combine **top-down and network-based** characteristics. The call for the initiative came from the Minister for Education, and the initiative's overall beneficiaries, schools, are represented by the Finnish National Agency for Education. The coordination group relied on insight from various ministries, government departments, academic institutions and organisations from pedagogical and environmental sectors.[3] At the regional level, the coordinators in Oulu worked collaboratively with input from an established network of hundreds of teachers and about 4,000 secondary school students.

The initiatives in Finland are **not finalised**. Thus, while initial results are already emerging, final impacts are not yet known. The objectives are ambitious in systematically directing the way for sustainability for primary and secondary education. GreenComp was not only used in the development of a common frame for the national initiative, but also actively advocated to the nearly one hundred awardees as a guideline for their activities. Therefore, it can be anticipated that the framework has been disseminated across the country. As exemplified in Opinvirta, the framework was **adopted as a key resource** for downstream activities in addition to serving as a high-level guideline.

France In France, there is a long history of bringing education for sustainability development (ESD) into the classrooms. In line with wider school reforms[4], the French Ministry of Education and Youth tasked a specific Expert Group (12-15 experts) with the creation of a **national proposition/framework** ("Proposal for strengthening education for sustainable development from primary to secondary school: principles, reference framework, approaches"[5]) which was **published in March 2023** and addresses school level education. The goal of the national ESD competence framework is to integrate ESD into all school levels and subjects.

While there is an overall obligation to implement the ESD competence framework, no timeline is foreseen/known for the implementation at regional and school level. As the French education system is centralised, implementation mostly happens in a top-down approach with the French Ministry for Education and Youth at the top, followed by the regional suborganisations (Académies), through which schools and teachers are organised. Implementation of the new

2   www.oph.fi/sites/default/files/documents/My%C3%B6nnetyt%20avustukset_syksy%202022.pdf

3   Involved organisations include Ministry of the Environment, Ministry of Foreign Affairs, the Energy Authority, the Centres for Economic Development, Transport and the Environment of Central Finland and the Uusimaa region, WWF Finland, the Trade Union of Education in Finland (OAJ), the Association of Finnish Municipalities, the Finnish Innovation Fund, Faculty of Educational Sciences of the University of Helsinki, Faculty of Education and Culture of the University of Tampere, Finnish Institute for Educational Research of the University of Jyväskylä, Department of Geography and Geology of the University of Turku, the University of Lapland, Faculty of Theology of the University of Helsinki, Suomen luokanopettajat ry (the association of classroom teachers of Finland), Teacher Student Union of Finland (SOOL),

4   Interview partners highlight that school reforms are planned at all levels of education, and ESD is usually not a main goal of these reforms. Instead, in primary education the fundamental subjects (e.g. French, Maths) have a higher priority. However, in lower secondary education, first projects, like developing joint school gardens, are emerging.

5   Ministry for National Education and Youth (2023). Propositions pour renforcer l'éducation au développement durable de l'école au lycée: principes, référentiel, démarches pédagogiques.

framework at a regional level is broken down into several steps: At schools, sustainability officers from different disciplines are trained on ESD in general and the national ESD competence framework in particular. This knowledge is then passed on to schools with the **sustainability officers acting as multipliers**. Going forward with the implementation the goal is to educate all teachers, regardless of their subject background.

The French ESD framework is known only within the ESD community (at school and policy level). The ministry, as well as the Académies are eager to spread awareness through **information events** as well as through spreading the published information material. The Ministry is trying to make it known through improving the link between national authorities and regional resources and the framework is being picked up in teacher education (initial and in-service training). However, there are **no statistics and evaluations commissioned** to measure the diffusion and use of the ESD Competence framework. That is why it is hard to quantify the diffusion of knowledge among teachers or to understand the impacts on students.

2 The use of GreenComp

Finland

In Finland, there were several individual positive elements about the GreenComp framework which were commented on by the project staff. To begin with, receiving an evidence-based definition of sustainability was highly appreciated. A consultee in the national initiative in Finland commented that the evidenced background as well as the readiness to offer a Europe-wide shared definition lent a high degree of credibility to the concepts adopted in the initiative in Finland. The framework was credited with having been developed and published **in the right place at the right time**, thus considerably expediting the national initiative.

The competences were a frequently raised element for both their outlook and content. The way in which they were structured and communicated was reported to support transferability in a pedagogical context. Moreover, themes like tolerating uncertainty, problem-framing as well as evidence-based systems thinking were deemed to be especially valuable resources for secondary school pupils to empower them as active problem-solvers.

In probing for challenges with the use of the framework, interviewees mentioned the **vastness and perceived complexity of GreenComp**; the digestion and adaptation of the contents were reported to be time-consuming. In addition, the practical examples presented in GreenComp were not necessarily deemed relatable to Finnish audiences. For this reason, and for the **lack of a Finnish translation** at the time of discovery, the coordination group in the national initiative opted to develop a version of their own. This hindered the immediate adoptability of the framework at the time, although an official translation has since been published.

Despite the complexity of the framework, GreenComp was generally deemed **unique in its offering**, particularly for the primary and secondary education sector. Although regional sustainability guidelines (particularly towards Net Zero) exist in more general terms, the consultee in Oulu deemed them to often overlook schools. Similarly, the coordinator in the funding initiative felt that GreenComp filled a national gap in concrete measures for sustainable skills development. Indeed, the national coordination group had originally planned to develop a sustainability framework of their own in collaboration with the academic field in Finland. At the time, the debate on concepts and approaches laid out in GreenComp existed at a fragmented level; GreenComp offered a fully integrated answer to the challenges which the initiative sought to address. As promoted by the funding initiative, **GreenComp was adopted as a key resource for the output**, in addition to other educational resources.

France

The French interview partners evaluate GreenComp as **complete, precise and useful** and they appreciate the emphasis on the complexity of competences and their development. The framework is perceived as enriching and deepening and was used as a source of inspiration. The Interview partners mention that GreenComp is quite new, and people are just getting to know it, which is why it is too early to draw final conclusions. Furthermore, the document was published as a guideline, not a strict set of rules. Therefore, our interview partners assume that it **will take years before it is used continuously**, which is also true for the national French ESD competence framework. Interviewees working within the expert group that designed the French ESD competence framework highlighted that GreenComp brought in a European viewpoint and offered a transdisciplinary language for all experts. GreenComp is perceived as being very clear and was easily adapted for the French school system.

GreenComp was published at about the same time as the French Expert Group started designing the ESD competence framework. This Expert Group consisted of experts in education from within the Ministry as well as from scientists from different thematic backgrounds. Much of the **GreenComp content was used for the French competence framework** (see following table). In addition to GreenComp, the expert group also included the Agenda 2030 by the United Nations, the UNESCO Roadmap for ESD[6], and the national French "Sustainable Development and Social Responsibility Guide"[7] (developed by the University of Grenoble and the French Ministry for Education and Youth in 2016). The table below shows that the **aspect of values is missing from the four domains**. However, this does not mean, that they are missing entirely from the framework, but that they were introduced in other areas or through other wording. This is because the French framework drew inspiration from other frameworks and needed to be compatible with the already existing French curriculum and their common base of knowledge, skills and culture. Another difference can be found in the emphasis on critical thinking as part of the French curricular system.

Figure 24 Comparison between the four domains of French propositions and GreenComp areas

Propositions for reinforcing Education for Sustainable Development	GreenComp framework
(Values are included in the French competence framework within the other sections, using different key words)	Embodying sustainability values (including competences: valuing sustainability, supporting fairness, promoting nature)
Use critical thinking to understand the issues surrounding sustainable development Embracing the complexity of sustainable development issues	Embracing complexity in sustainability (including competences: systems thinking, critical thinking, problem framing)
Behaving ethically and responsibly towards the environment and human society	Envisioning sustainable futures (including competences: futures literacy, adaptability, exploratory thinking)
Acting individually and collectively to build a sustainable world	Acting for sustainability

Source: Comparison conducted by Technopolis based on respective strategies / policy documents.

3 The context - enabling conditions and challenges

Finland

In Finland, the complexity of GreenComp has required a significant **time-investment** in the adaptation process. Despite the multi-year timelines, the representatives at the national and regional initiatives both voiced the wish for a longer funding period. Although part of this was due to the time taken for the **digestion and adaptation of the framework**, importantly, the consultees felt that more time is needed to **educate the target audiences** about GreenComp.

Interviewees also raised the prevailing **politicisation of the sustainability topic** as both an enabler and a barrier. The national initiative was launched at the behest of a former government with a higher disposition to support environmental and sustainable values and strategies and the continuation of these initiatives is not guaranteed after a change in political priorities. Moreover, there was some anticipation of push back from part of the public where sustainability initiatives are concerned more generally.

The GreenComp framework was successfully adapted for the Finnish national and regional contexts, which suggests a **high degree of transferability** for the framework in the primary and secondary education sector. Moreover, topics like active agency, critical thinking and problem-framing featured in the framework were reportedly highly suitable for the indirect

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6   UNESCO (2020). Education for sustainable development: a roadmap. https://unesdoc.unesco.org/ark:/48223/pf0000374802.locale=en

7   Conférence des Présidents d'Université & (Conférence des Grandes Ecoles (2016): Guide Compétences Développement Durable & Responsabilité Sociétale.

target audience of secondary school students.

The geographical coverage for GreenComp, or GreenComp-influenced resources, was considerable in Finland. As such, the **distribution of resources to regional actors** can be considered viable for the promotion of the framework more generally. However, for the ambition of the overall project entities (of both, the national and funded initiatives), more time and central expertise on GreenComp was hoped for to maximise the promotion and full understanding of the framework.

France

Facilitating factors according to French interview partners are **political will** and respective **time and resources** to embed ESD in education. In France, the **political climate** was very positive towards ESD two to three years ago, while today political priorities have shifted slightly. There have been some unexpected effects in the implementation of the framework into school-life. A major positive aspect of the implementation is that there is now an institutionalised exchange between teachers from different disciplines. This was previously only possible within the departments and the competence framework provides the common language for this exchange. However, putting this into practice can be very difficult for teachers. This is why the expert group came up with topic-related benchmarks[8], that are adding to the benchmarks within the ESD competence frameworks. Some have already been published, but others are still being written and these are intended to be helpful for teachers. These in turn must be put into practice in the same way as the previous ESD framework, e.g. through top-down information events.

4 Leasons learnt and recommendations

The implementation of GreenComp in a national and/or regional context **requires strong policy and high-level decision-making support**. This support is essential for both decentralized and centralized systems to effectively translate and/or integrate GreenComp principles to regional or national education contexts. In addition to policy backing, **securing funding**, as demonstrated in the case of Finland, is crucial for the successful adaptation of GreenComp initiatives. Finally, **effective communication strategies** are also vital to ensure awareness and understanding among stakeholders.
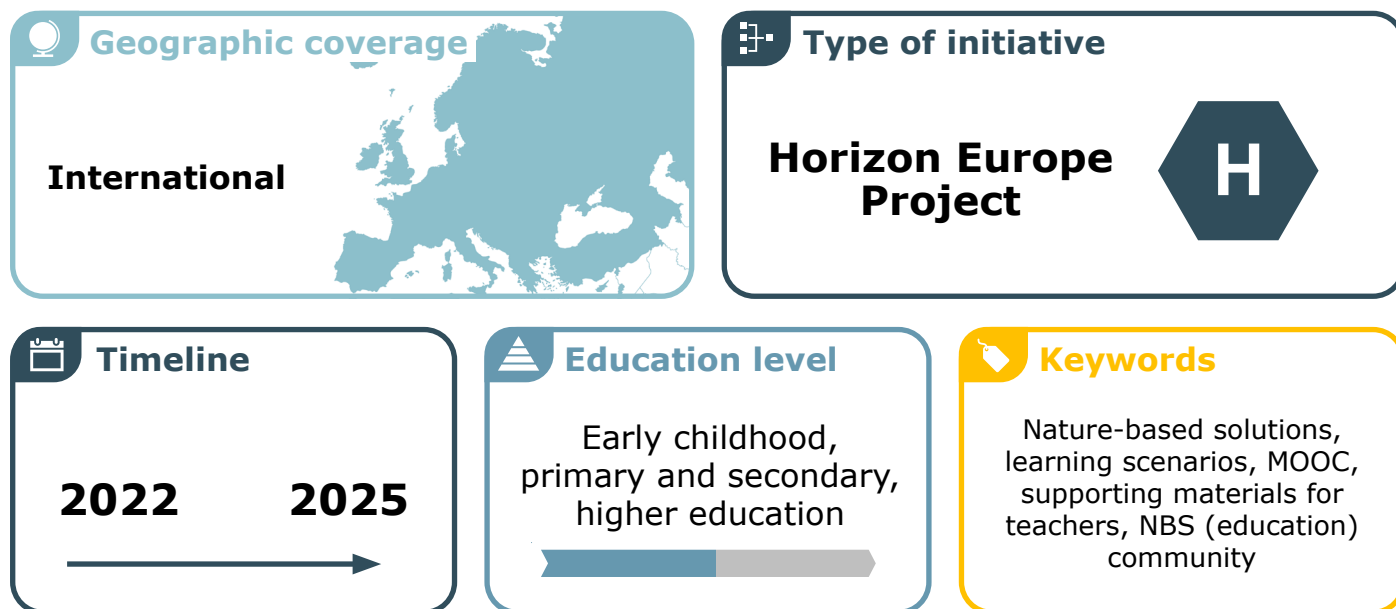
Interview partners have highlighted that the core lessons from the present initiatives evolved around the time-consideration for the use of GreenComp. As outlined, the reasons for this concern the full comprehension and appropriate adaptation of the framework, which was deemed critical by the Finnish interviewees. The case study indicates that **GreenComp can be a highly useful tool for different pedagogical ends**, but that it tends to be **adapted or repurposed** to fit contextual needs. In addition, there is an indication of further interest in additional learning opportunities from GreenComp experts.

Educators/teachers are looking for **guidance** regarding ESD, and a **framework adjusted to the national context** can provide the needed details. Feedback or an overview of the implementation are so far not available as the French framework is also quite new. In accordance with the European Green Deal and the European Education Area, the GreenComp Framework could be highlighted and implemented even more in national contexts, **without** designing a **strict top-down approach**.

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8   French Ministry of Education and Youth (2023). Education for sustainable development and the ecological transition. Progress References. https://eduscol.education.fr/document/52578/download

Case Study

NBS EduWORLD
Developing learning scenarios

Geographic coverage

International

Type of initiative

Horizon Europe Project

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Timeline

2022 **2025**

Education level

Early childhood, primary and secondary, higher education

Keywords

Nature-based solutions, learning scenarios, MOOC, supporting materials for teachers, NBS (education) community

1 Overview of the case study

Objectives

NBS EduWORLD is a 3-year Horizon Europe-funded project, coordinated by European Schoolnet[1]. NBS EduWORLD established a community[2] for nature-based solutions in education that aims to create synergies between NBS professionals and education providers and free and easy access to NBS knowledge and resources for all.

Nature-based solutions (NBS) are **solutions that are inspired and supported by nature**, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience. Such solutions bring more and more diverse nature and natural features and processes into cities, landscapes and seascapes, through locally adapted, resource-efficient and systemic interventions. Nature-based solutions must therefore benefit biodiversity and support the delivery of a range of ecosystem services.[3]

Stakeholders

NBS EduWORLD's Consortium comprises **16 partners from 13 European countries**. The Consortium brings together researchers, educators, NBS practitioners, entrepreneurs, scientists, public bodies, policy makers and football community members with the common goal of **building a community through a vast combination of approaches**, one of which creating and providing access to **engaging and locally relevant educational materials** centring the environmental, social and professional merits of NBS. **The Consortium** engages:

- **International organisations and networks**: European Schoolnet (Belgium), the European Football for Development Network (Netherlands), ICLEI Europe (Germany);

- **Ministries**: The Ministry of Youth and Sports (Türkiye) and **local authorities**:

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1   European Schoolnet is a network of 30+ Ministries of Education based in Brussels, Belgium: http://www.eun.org/

2   The NBS EduHub can be accessed at this link: https://nbseduworld.eu/

3   Definition of NBS by the European Commission: https://research-and-innovation.ec.europa.eu/research-area/environment/nature-based-solutions_en

Municipality of Genoa (Italy), Offaly Country Council (Ireland), Almada Municipality (Portugal);

- **Gamification experts and performance art experts:** Natural Solutions (France), The Big Van Theory (Spain);

- **Higher education institutions, schools and research organisations**: Trinity College Dublin (Ireland), Ellinogermaniki Agogi (Greece), Public Policy and Management Institute (Lithuania);

- **Associations and non-profit organisations**: Centre for Experiments in Urban Studies (Serbia), Association Verde e Moldova (Moldova), Horizon Nua (Ireland);

- **Museums:** National Museum of National History (France).

Target groups

The NBS EduWORLD project provides educators with a **repository** of ready-to-use and clearly structured materials, such as **learning scenario**s (LS) specifically designed to integrate NBS into the curriculum for early childhood education, primary education and secondary education. The materials can guide teachers in incorporating NBS concepts, activities, and assessments into existing subjects like sciences, geography, environmental studies and even language studies.

To adequately engage educators at different points on their NBS journey, the project provides **specific activities** for those not yet familiar with the concept and benefits of NBS, and those already aware but in need of support to progress to the next stage. The following resources and activities proposed by the project will facilitate the integration of NBS into classrooms, and they draw upon the GreenComp framework:

- During its first year, NBS EduWORLD developed **15 learning scenarios**[4] which specifically aim to address the environmental and social challenges linked to NBS and provides key practical examples of how the GreenComp framework can be used in primary and secondary education to raise students' awareness of the key importance of sustainability. In addition, the project disseminates other NBS learning scenarios, e.g. those developed during the pilot project Integrating Nature-Based Solutions in Education[5], funded by the European Commission. The learning scenarios address different levels of education, including:

  - Early childhood education (1 LS),

  - Primary education (11 + 2 LSs for both primary and secondary),

  - Secondary education (20 + 2 LS as above, both primary and secondary).

  While all learning scenarios are available in English, some of them are translated into 15 languages of EU Member States.

- NBS EduWORLD has also created the **Massive Open Online Course** (MOOC) for teachers "Exploring Nature-Based Solutions in Your Classroom (2023)"[6], which focuses on GreenComp, NBS concepts, methodologies, practical implementation strategies, as well as provides guidance for creating NBS learning scenarios based on a custom-made NSB EduWORLD template, thereby helping teachers learn how to implement the topic in their lessons.

NBS EduWORLD has been a partner in the **STEM Discovery Campaign in 2023**[7] (organised by Scientix[8]) **and in 2024**[9] (co-organised by Scientix and Life Terra[10]) - an annual international Campaign highlighting best teaching and learning practices, and promoting integration of STEM (and NBS) in education. With a reach of 360,000 participants in 2023, through this Campaign NBS EduWORLD encouraged teachers to submit original learning scenarios, best practices and activities based on GreenComp Framework and the 12 NBS societal challenge areas[11], further

4   NBS EduWORLD resources hub: https://nbseduworld.eu/resources
5   Integrating Nature-Based Solutions in Education Pilot: https://www.scientix.eu/community/partner-projects/nbs
6   European Schoolnet Academy MOOC "Exploring Nature-Based Solutions in Your Classroom" (2023): www.europe-anschoolnetacademy.eu/courses/course-v1:Scientix+NBS+2021/about#:~:text=The%20learning%20scenarios%20presented%20in,include%20suggestions%20for%20online%20implementation.
7   STEM Discovery Campaign 2023: https://www.scientix.eu/campaigns/sdc/sdc23
8   Scientix, the community for science education in Europe: https://www.scientix.eu/
9   STEM Discovery Campaign 2024: https://www.scientix.eu/campaigns/sdc/sdc24
10   Life Terra project: https://www.lifeterra.eu/en
11   12 NBS societal challenge areas: https://op.europa.eu/en/publication-detail/-/publication/edab5ab8-94b7-11ee-b164-01aa75ed71a1/language-en/format-PDF/source-303181336

helping to ensure teachers gained good understanding of NBS and had opportunities to learn from each other.

2 The use of GreenComp

NBS EduWORLD started using GreenComp across its various project activities **when it was first launched by the Commission in** 2022. The learning scenarios developed in 2023 **adopt at least one of the four key areas of the GreenComp framework**, namely embodying sustainability values, embracing complexity in sustainability, envisioning sustainable futures, acting for sustainability.

In NBS EduWORLD, the **learning scenarios** have been **co-created** by teachers and pedagogy experts who developed the **15 learning scenarios**. These learning scenarios target different grade levels and learning objectives, which allows teachers to tailor the content for their specific classroom and curriculum context. For instance, in the **learning scenario "Greenize your school and create a school garden in an urban environment"**[12] students learn about plants, how to create crafts, and build biodomes. They explore digital literacy through designing a 3D school garden and building a plant-watering robot. Through this learning scenario, students cultivate environmental awareness and unleash their innate connection with nature. All the **four areas of GreenComp** are drawn upon in this scenario: embodying sustainability values, embracing complexity in sustainability, envisioning sustainable futures and acting for sustainability.

Additionally, during the 2023 STEM Discovery Campaign, teachers were asked to familiarise themselves with GreenComp and create original learning scenarios addressing at least one of the GreenComp areas. This practice ensured teachers had a good enough understanding of the competence framework to link with the learning scenarios. Similarly, the 2024 STEM Discovery Campaign invites submissions by teachers of more learning scenarios and good practices for formal education, as well as inspiring non-formal education activities.

The GreenComp framework has been also incorporated in its entirety and as an integral component within the project's MOOC "Exploring Nature-Based Solutions in Your Classroom (2023)". The MOOC guides educators how to effectively integrate NBS into their lessons through NBS learning scenarios, while also acquainting them with the principles of GreenComp, among other.

Another example from the project includes the use of GreenComp as a pillar in the Whole School Approach (WSA), which in NBS EduWORLD is applied as a methodology for establishing the schools as NBS living labs. Therefore, all the WSA pillars are developed through the lens of GreenComp (curriculum - learning scenarios, pedagogies and learning methods that promote GreenComp, teacher training workshops, and the NBS EduWORLD Summer school).

3 The context - enabling conditions and challenges

NBS EduWORLD was inspired by a previous project funded by the European Commission, the Integrating Nature-Based Solutions in Education Pilot. This predecessor project helped European Schoolnet realise that the topic of NBS needed a larger variety of resources to better support educators. This realisation prompted the **creation of a large Consortium** for NBS EduWORLD to help offer a wide geographical coverage and thereby contextual knowledge for the implementation and interpretation of sustainability competences.[13]

When NBS EduWORLD started, the NBS field was in its nascent stage, **lacking comprehensive resources for supporting or training teachers** in integrating NBS in the classroom. Consequently, the project opted to utilise GreenComp due to its capacity to offer educators and teachers **a degree of guidance** that can be readily tailored to specific contexts. Teachers have shown a **positive attitude** towards embracing the nature-based solutions topic within the classroom, and acknowledged the important use of the GreenComp framework in enhancing

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12 https://files.eun.org/SciEduDept/NBSEdW/LS/NBSEdW_LS_Greenize_your_school.pdf
13 https://nbseduworld.eu/partners

students' understanding and actions on environmental and sustainability challenges. Nevertheless, substantial effort remains necessary to fully incorporate these principles into curriculums across Europe.

NBS EduWORLD also puts emphasis on the **dissemination of the learning scenarios** together with other materials developed in existing communities, such as the GreenComp Community of Practice, as well as through various events (e.g. STEM Discovery Campaign, the Back to School Campaign, the annual NBS EduCommunity Workshop, the NBS EduWORLD Summer School, the NBS EduWORLD Summit, conferences, webinars, workshops, etc.).

4 Leasons learnt and recommendations

The GreenComp framework is perceived to be **easy to read and understand**, and the series of **supporting materials and resources are very useful to have**. Overall, GreenComp is regarded as an **excellent framework** which can and should be utilised in teaching and learning activities as well as various other applications.

The competence framework offers a solid foundation, it is important to acknowledge that its practicality and applicability depend on tailoring to meet the intended purpose. The **teachers involved** in the development of the learning scenarios **have positively reacted** to the use of GreenComp; showed **strong enthusiasm** for understanding GreenComp and the **topic of climate change and sustainability.**