European Commission

JRC SCIENCE FOR POLICY REPORT

GreenComp

The European sustainability competence framework



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2022

Joint Research Centre

EUR 30955 EN

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EU Science Hub
https://ec.europa.eu/jrc

JRC128040

EUR 30955 EN

PDF
ISBN 978-92-76-46485-3
ISSN 1831-9424
doi:10.2760/13286

Luxembourg: Publications Office of the European Union, 2022.

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Design, visuals and layout: Daniel N. Buxton (https://danielnbuxton.com)

How to cite this report: 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; ISBN 978-92-76-46485-3, doi:10.2760/13286, JRC128040.

Abstract

The development of a European sustainability competence framework is one of the policy actions set out in the European Green Deal as a catalyst to promote learning on environmental sustainability in the European Union. *GreenComp* identifies a set of sustainability competences to feed into education programmes to help learners develop knowledge, skills and attitudes that promote ways to think, plan and act with empathy, responsibility, and care for our planet and for public health.

This work began with a literature review and drew on several consultations with experts and stakeholders working in the field of sustainability education and lifelong learning. The results presented in this report form a framework for learning for environmental sustainability that can be applied in any learning context. The report shares working definitions of sustainability and learning for environmental sustainability that forms the basis for the framework to build consensus and bridge the gap between experts and other stakeholders.

GreenComp comprises four interrelated competence areas: 'embodying sustainability values', 'embracing complexity in sustainability', 'envisioning sustainable futures' and 'acting for sustainability'. Each area comprises three competences that are interlinked and equally important. *GreenComp* is designed to be a non-prescriptive reference for learning schemes fostering sustainability as a competence.

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Foreword

To protect the health of our planet and our public health, it is crucial to integrate sustainability into our education and training systems. Education and training enable learners to develop competences and acquire the knowledge, skills and attitudes needed to truly value our planet and take action to protect it. This will help achieve the transition to a fairer, greener economy and society. To this end, and among other priorities, the European Commission has made learning for environmental sustainability a priority for the upcoming years.

Following successful initiatives to foster competence-based education for lifelong learning in the past years, the Commission has developed this European Sustainability Competence Framework, *GreenComp*, as announced in the *European Green Deal*. The Member States of the European Union have already begun incorporating sustainability concepts into academic and vocational curricula. Building on this work, *GreenComp* can support all educators and learners in embedding environmental sustainability topics into all educational systems and curricula in Member States.

Our aim is to provide a shared competence framework on sustainability at European level as a common basis to guide both educators and learners. Building a common understanding on sustainability can act as a catalyst for action. *GreenComp* draws on the advice and consensus of numerous experts and stakeholders. The Commission encourages Member States to use it as a reference when rolling out educational initiatives on sustainability.

GreenComp builds on the method developed, tested, and validated by the JRC to create the Digital Competence Framework for Citizens (*DigComp*), the Entrepreneurship Competence Framework (*EntreComp*), and the European Framework for Personal, Social and Learning to Learn Key Competence (*LifeComp*).

The Council Recommendation on learning for environmental sustainability and *GreenComp* are part of EU's strategic action to promote learning for environmental sustainability.

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Executive summary

***GreenComp* responds to the growing need for people to improve and develop the knowledge, skills and attitudes to live, work and act in a sustainable manner.**

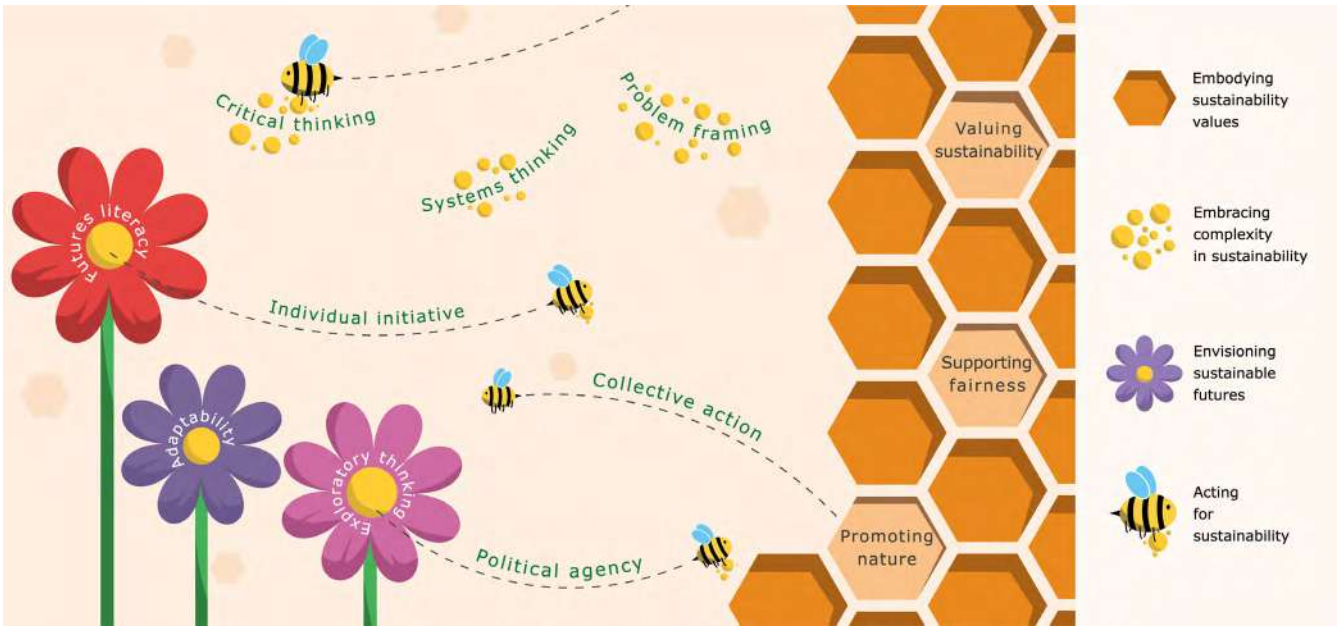
GreenComp is a reference framework for sustainability competences. It provides a common ground to learners and guidance to educators, providing a consensual definition of what sustainability as a competence entails. It is designed to support education and training programmes for lifelong learning. It is written for all learners, irrespective of their age and their education level and in any learning setting – formal, non-formal and informal[i]. Sustainability competences can help learners become systemic and critical thinkers, as well as develop agency, and form a knowledge basis for everyone who cares about our planet's present and future state.

The aim of *GreenComp* is to foster a sustainability mindset by helping users develop the knowledge, skills and attitudes to think, plan and act with empathy, responsibility, and care for our planet. *GreenComp* is the result of a robust research methodology that has involved a large and diverse group of experts and stakeholders, to build a consensus on an agreed proposal. It provides a general reference model that everyone involved in lifelong learning can use to design learning opportunities aimed at developing sustainability competences and to assess progress in supporting education and training for sustainability.

GreenComp consists of 12 competences (in **bold**) organised into the four areas (in *italics*) below:

- *Embodying sustainability values*, including the competences
  - **valuing sustainability**
  - **supporting fairness**
  - **promoting nature**
- *Embracing complexity in sustainability,* including the competences
  - **systems thinking**
  - **critical thinking**
  - **problem framing**
- *Envisioning sustainable futures,* including the competences
  - **futures literacy**
  - **adaptability**
  - **exploratory thinking**
- *Acting for sustainability,* including the competences
  - **political agency**
  - **collective action**
  - **individual initiative**

i Definitions for key terms used throughout the document can be found at the end of this report.



Visual representation of *GreenComp*.

GreenComp responds to the ambitions set out in the European Green Deal. Following this political direction, the Commission has published policy papers entitled *European Skills Agenda for Sustainable Competitiveness, Social Fairness and Resilience* (2020) and the *European Education Area by 2025* (2020) underscoring the need to develop a European competence framework on sustainability. In these policy papers, the Commission explicitly recommends activating education and training by developing skills, including upskilling and reskilling, and by investing in learning for environmental sustainability. The *EU biodiversity strategy for 2030: 'Bringing Nature Back into our Lives'* (2020) also highlights the important role education and training have in enabling the EU to reach its goal to become a climate-neutral continent by 2050.

As a reference tool, *GreenComp* can serve a wide range of purposes, including curricula review; design of teacher education programmes; (self-) assessment/reflection, policy development, certification, assessment, monitoring and evaluation.

Acknowledgements

The authors would like to express their gratitude to everyone involved in the participatory process that contributed to bringing *GreenComp* to life. Their dedication, enthusiasm and passion for sustainability and lifelong learning are greatly appreciated.

Thanks to all stakeholders who participated and contributed to our series of workshops held from April to October 2021: Carlos **Alvarez Pereira**, Club of Rome; Helena **Alves**, European University Foundation; Albena **Azmanova**, University of Kent; Meg **Baker**, Students Organising for Sustainability UK; Matthias **Barth**, Eberswalde University for Sustainable Development; Olena **Bekh**, European Training Foundation; Pauline **Boivin**, Lifelong Learning Platform; Erica **Bol**, JRC; Pauline **Bonino**, European Network for Social Integration Enterprises; Katja **Brundiers**, Arizona State University; Alessandro **Caforio**, Università Telematica Internazionale UNINETTUNO; Ignacio **Calleja**, EIT Raw Materials; Paolo **Canfora**, JRC; Noelia **Cantero**, EARLALL; Gisela **Cebrián Bernat**, Universitat Rovira i Virgili; Valentina **Chanina**, EfVET; Martina **Comparelli**, Fridays for Future; François **Dessart**, JRC; Paola **Di Marzo**, Erasmus Student Network; Anastasia **Fetsi**, European Training Foundation; Daniel **Fischer**, Wageningen University & Research; Emma **Fromberg**, University of Cambridge; Ann **Finlayson**, Sustainability and Environmental Education; Conor **Galvin**, University College Dublin; Marie **Goiset**, Ministry of national education, youth and sports, France; Agueda **Gras-Velazquez**, European Schoolnet; Dirk **Hastedt**, International Association for the Evaluation of Educational Achievement; Rayka **Hauser**, DG Environment; Simon **Herteleer**, UNECE – Education for Sustainable Development; Elisabeth **Hofmann**, Université Bordeaux Montaigne; Gohar **Hovhannisyan**, European University Association; Tom **Janssen**, Flemish Department of Environment; Jonas **Husum Johannesen**, Ministry of Higher Education and Science, Denmark; Panagiotis **Kampylis**, National Research Council of Italy; Simon **Kemp**, University of Southampton; Arja **Krauchenberg**, European Parents' Association; Wim **Lambrechts**, Open Universiteit; Elizabeth **Lange**, University of Technology Sydney; Yolanda **Lechón**, CIEMAT; Alexander **Leicht**, UNESCO; Rodrigo **Lozano**, University of Gävle; Davide **Magagna**, Ministry of Ecological Transition, Italy; Hanna **Malhonen**, Federal Ministry for Education, Science and Research, Austria; Michela **Mayer**, Italian Association for Sustainability Science; Miriam **Molina Ascanio**, European Schoolnet; Petra **Molthan-Hill**, Nottingham Trent University; Monica **Moso Díez**, Dualiza; Joanna **Napierala**, CEDEFOP; Mari **Nishimura**, UNEP; Terhi **Nokkala**, University of Jyväskylä; Teresa **Oberhauser**, AEGEE - European Student Forum; Violeta **Orlovic Lovren**, University of Belgrade; David **Osimo**, Lisbon Council; Ana **Prades**, CIEMAT; Giuseppe **Pellegrino**, DG RTD; Mónika **Réti**, Ministry of Human Capacities of Hungary; Marco **Rieckmann**, University of Vechta; Monika **Rybova**, Ministry of Education, Science, Research and Sport of the Slovak Republic; Alfredo **Soeiro**, AECEF - Association of European Civil Engineering Faculties; Stephen **Sterling**, Plymouth University; Daniella **Tilbury**, HM Government of Gibraltar and Cambridge University; Paul **Vare**, University of Gloucestershire; Lyubov **Vasylchuk**, European Schoolnet; Silvia **Velázquez Rodríguez**, Ministry of Education and Vocational Training of Spain; Oliver **Wolf**, JRC; Brikena **Xhomaqi**, Lifelong Learning Platform; Aravella **Zachariou**, Cyprus Ministry of Education, Culture, Youth and Sports; and Jakub **Zaludko**, Bridge 47.

Thanks to our European Commission colleagues who invested their time and energy. They have been critical readers, stimulating facilitators at our workshops, attentive note-takers and feedback providers: Federico **Biagi**, JRC; Susan **Bird**, DG EMPL; Romina **Cachia**, JRC; Anastasia **Economou**, JRC; Ignacio **González Vázquez**, JRC; Deirdre **Hodson**, DG EAC; Zoe **Jacquot**, DG EAC; Georgios **Kapsalis**, JRC; Giovanna **Mazzeo Ortolani**, JRC; Marco **Montanari**, JRC; Arianna **Sala**, JRC; and Tim **Schreiber**, DG EMPL. Thanks also to Chiara **Scalabrino**, external expert, for her initial support.

We thank our technical colleagues in the JRC for their support: Susana **Bernal**, Ana **Cases**, Paola **Dalmiglio**, Ana **García Fatela**, Kriss **Elin Rokk**, Larisa **Rusu**, and Andrea **Santoro**.

Thanks to our colleagues from DGT who edited this report: Roslyn **Bottoni**, Wouter **Provoost** and Owen **Stafford**, with support from Raimondo **Cadoni**.

Thanks to Michael **Teutsch** and Anna Maria **Giannopoulou**, heading the Unit at EAC on 'Schools and Multilingualism', and Ioannis **Maghiros**, head of the JRC Unit 'Human Capital and Employment', for their support and availability. Special thanks to Vladimir **Garkov**, DG EAC, for his earlier work.

A heartfelt acknowledgement goes to the young folks at *RadioImmaginaria* for engaging with their peers about the importance of fostering education for sustainability and producing a video.

1. Introduction

Ensuring a fair and decent livelihood for all people, regenerating nature and enabling biodiversity to thrive, have never been more important. It is one of the most pressing duties that humanity faces. This requires shifting away from unsustainable practices and placing value on the environment on which our future as a species and our planet's future depend. This systemic change cannot be achieved only through political agreements, financial incentives or technological innovations, important and necessary though they are. Long-lasting change requires lifelong learning[1].

Creating opportunities to enable learning for environmental sustainability has therefore become crucial for the present and the future of our planet. The ecological crisis affects everyone and all aspects of society. Having a common understanding can be a catalyst for action and for a shared strategy on learning for environmental sustainability so that we can understand, act on and resolve this crisis together. Timely strategic action is necessary to help Europeans participate fully in the green transition of our economy and society, rather than simply reacting to it. Learning for environmental sustainability is part of this strategic action.

A competence-based education that helps learners develop sustainability skills based on knowledge and attitudes can help promote responsible action and stimulate willingness to take or demand action at local, national and global level. Becoming competent in sustainability issues will enable learners overcome the cognitive dissonance that comes from knowing about an issue but lacking the agency to act.

The European Commission is committed to meeting the Sustainable Development Goals (SDGs)[ii], and quality education (SDG 4) is key to achieve all SDGs. In line with the critical role of lifelong learning[2], developing sustainability competences through education and training has become a policy objective for the EU and its Member States. Sustainability is one of the European Commission's key priorities in education and training for 2019 – 2024[3].

The *European Green Deal* (2019)[4], the *European Skills Agenda for Sustainable Competitiveness, Social Fairness and Resilience* (2020)[5], and *Achieving the European Education Area by 2025* (2020)[6] have underscored the need to develop a European competence framework on sustainability. The *EU biodiversity strategy for 2030: 'Bringing Nature Back into our Lives'* (2020)[7] also highlights the important role education and training have for Europe to become a climate-neutral continent by 2050.

The European Commission has developed *GreenComp* as a reference framework on sustainability competences at EU level. It provides a common ground to learners and guidance to educators, providing an agreed definition of what sustainability as a competence entails. Such a shared understanding can act as a catalyst for learning for environmental sustainability by supporting education and training institutions to develop, review and adapt their vision and practices with regard to teaching and learning for sustainability.

ii https://sdgs.un.org/goals.

1.1 Aims

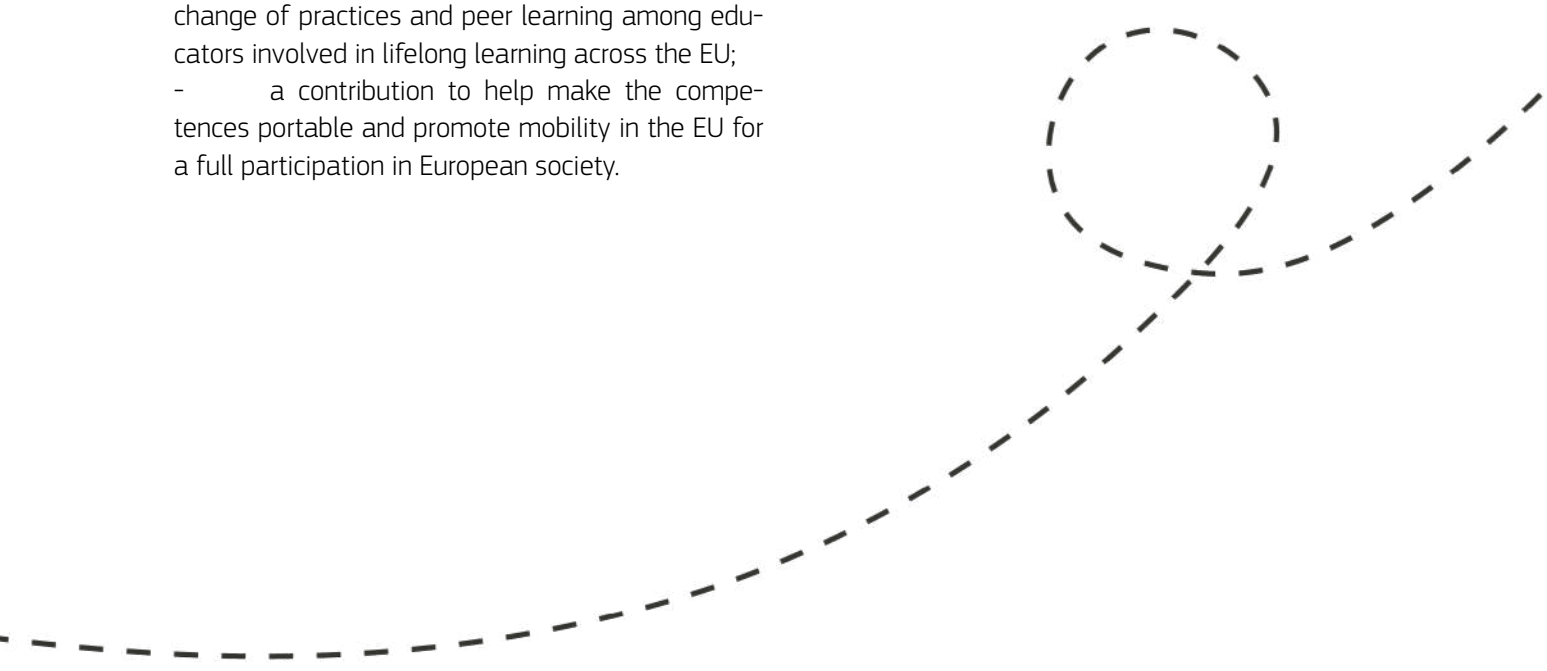
GreenComp can support education and training systems in shaping systemic and critical thinkers who care about our planet's present and its future. All 12 competences of the framework are applicable to all learners, irrespective of their age and their education level and in any education settings – formal, non-formal and informal. The proposed model can complement and strengthen existing international, national, regional and local efforts to capture sustainability competences. Its added value is that it provides:

- a model of sustainability competence areas and competences;
- a common reference that everyone working in education and training for environmental sustainability can use, share and refer to;
- an initial list of competence components, namely knowledge, skills and attitudes[iii], as examples of how to put the competences into practice;
- a common reference basis for dialogue, exchange of practices and peer learning among educators involved in lifelong learning across the EU;
- a contribution to help make the competences portable and promote mobility in the EU for a full participation in European society.

1.2 Methodology

The European sustainability competence framework is the result of consensus building based on a mixed method research process[iv]. This process has led to the gradual and progressive refinement of *GreenComp* and, ultimately, the consolidated framework set out in this report. To achieve this, a diverse group of approximately 75 experts and stakeholders was consulted at different stages to obtain their feedback and progressively reach a consensus. The group included experts on sustainability education and lifelong learning from academia and research institutions, youth representatives, educators, policy representatives from EU Member States and NGOs.

The steps taken to develop the *GreenComp* framework are shown in Figure 1.



[iii] We adopt the definition of competence following the 2018 Council Recommendation on Key Competences for lifelong learning, whereby a competence is "a dynamic combination of the knowledge, skills and attitudes" (p.12). https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.C_.2018.189.01.0001.01.ENG&toc=OJ:C:2018:189:TOC

[iv] A similar method was used successfully in adopting other European competence frameworks developed by the Commission, such as ***DigComp***; the European framework for digital competence ***EntreComp*** , the European framework for entrepreneurship competence; and ***LifeComp*** , the European framework for 'Personal, social and learning to learn'. They form part of the eight competences of the 2018 Council Recommendation on lifelong learning.

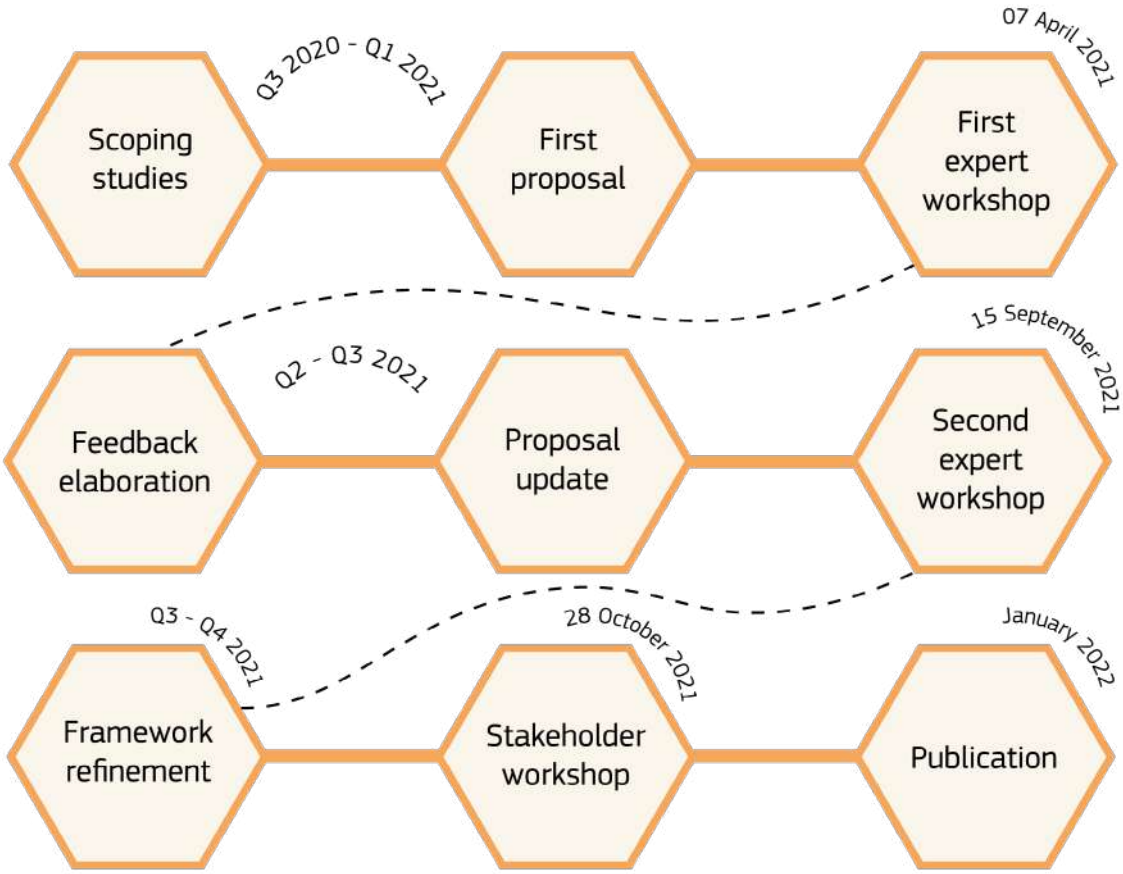


Figure 1. Main steps to develop *GreenComp*.

The framework was developed through the following steps.

- Scoping studies were conducted, which included a literature review by Guia Bianchi (2020)[8] and a complementary study by Chiara Scalabrino (2021, forthcoming).
- Four competence areas including a list of competences and their components were identified and put forward, constituting a draft proposal for the framework.
- An expert workshop was held, where the preliminary material was presented and discussed by experts on sustainability education and lifelong learning[v].

Key takeaways from the first expert workshop: Experts endorsed the initiative of building a sustainability competence framework for lifelong learning to complement existing sustainability frameworks which mainly target higher education. It was argued that this framework should focus on specific competences for sustainability, while it should be left to other frameworks (including those already developed by the Commission) to describe cross-cutting or generic competences which may be relevant, but not exclusive, to sustainability.

Regarding competence areas, experts highlighted the importance of sustainability values in relation to other competences. They highlighted the need to change vocabulary for the area focused on problem solving and finding solutions, in favour of action-based competences and the acknowledgement that 'wicked' sustainability problems, i.e. highly complex and ill-structured problems[9], cannot, strictly speaking, be solved.

Furthermore, experts suggested using the word 'sustainability' rather than 'environmental sustainability' to acknowledge the multidimensionality of this concept.

v A background document was sent to experts ahead of that workshop and a debrief was drafted as a result.

- The framework was consolidated in a revised draft proposal, comprising four competence areas and 12 competences. Its consolidation was based on feedback collected during the workshop and afterwards by engaging in an ongoing dialogue with experts.
- An update of the proposal was enabled thanks to a set of knowledge-skill-attitude (KSA) statements being developed for each competence, which helped refine their scope and update the competence framework. These statements can be found in Appendix 1.
- A second expert workshop was held to refine the framework[vi].

Key takeaways from the second expert workshop: Experts endorsed the framework presented in September 2021, with the possibility to adopt minor revisions suggested before its finalisation.

Most experts felt that the scope of some KSA statements needed refining, while the language used in these statements needed simplifying. These statements should be all-encompassing but at the same time user-friendly and applicable to different education levels.

Experts advised that competences should be refined by better aligning their descriptions to their areas. In addition, they encouraged a metaphor and narrative to be developed around the framework.

- The conceptual framework was refined based on comments received during or shortly after the second workshop.
- A third workshop was held with stakeholders from Member States to validate the conceptual framework[vii].

Key takeaways from the third workshop held with stakeholders: Stakeholders broadly endorsed *GreenComp* in its current version as well as its accompanying metaphor. They agreed on the name *GreenComp*, on its phonetics and simplicity in terms of the alternatives proposed earlier. *GreenComp* was accepted in its current version.

All stakeholders agreed that individual competence frameworks needed to be presented as part of a comprehensive vision, where learner outcomes are developed across the board. In addition, follow-up activities were discussed.

- *GreenComp* is published together with the Commission's proposal for a Council recommendation on learning for environmental sustainability and the accompanying staff working document.

1.3 Limitations

Although widely endorsed by subject-matter experts and representative of different stakeholder groups, the framework has not yet been tested in a real setting. Putting *GreenComp* into practice, by rolling it out and evaluating it in a specific context, could and should lead to amending and refining it based on feedback from practitioners and end users. The framework should thus be treated as a living document.

Another challenge is the wide scope of this framework, targeting all people, from young children to adults, thus touching upon different educational settings. Moreover, due to the vast and rapidly evolving nature of the sustainability concept, this framework depicts competences necessary for sustainability as an overarching topic. Therefore, subfields are not directly addressed in this context. Some examples of these competences include but are not limited to, responsible production and consumption, competences for the circular economy, or competences for specific education levels. Future developments in these directions can very well be envisaged on the basis of *GreenComp*.

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, including this competence

vi A background document was sent to experts together with a spreadsheet for feedback.

vii A background document was sent to invited stakeholders and a debrief was drafted as a result.

framework, only form part of the puzzle. Systemic change towards sustainability is a global necessity and a shared responsibility. Investments in research and innovation, laws and regulations, technological eco-innovations, transparency and accountability by companies and global value chains are required to achieve a comprehensive change. Individual behaviour should be supported by enabling measures and contexts that are all designed by, with, and for the people and the planet.

1.4 Structure of the report

Following the introduction, **Chapter 2** introduces the terminology and concepts that form the basis of *GreenComp*, namely its definition; an overview of how people learn for environmental sustainability; and the definition of a sustainability competence.

Chapter 3 introduces *GreenComp*, with its four competence areas, 12 sustainability competences and related descriptors. Section 3.1 introduces the metaphor used to illustrate *GreenComp*.

Chapter 4 provides descriptions of the competence areas and the sustainability competences. This is followed by how they are applied in practice.

Chapter 5 describes options for further development.

Appendix 1 presents use cases, which aim to show how the 12 sustainability competences are equally important and interrelated when it comes to thinking, planning, and acting to achieve sustainability. **Appendix 2** contains the list of competence components, namely knowledge, skill and attitude statements developed to define and refine the sustainability competences.

2. Defining sustainability

2.1 A working definition of sustainability

There is broad consensus that sustainability themes need to be embedded in lifelong learning. However, sustainability is a complex concept to define and is very ambiguous[10].

Sustainability means different things to different groups of people at different times[11]. Often, sustainability and sustainable development[viii] are used interchangeably, despite their conceptual difference. As claimed by UNESCO[12], sustainability is best described as a long-term goal, such as attaining a more sustainable world, while

viii As expressed in the UN's 'Our Common Future' (or Brundtland Report), 1987.

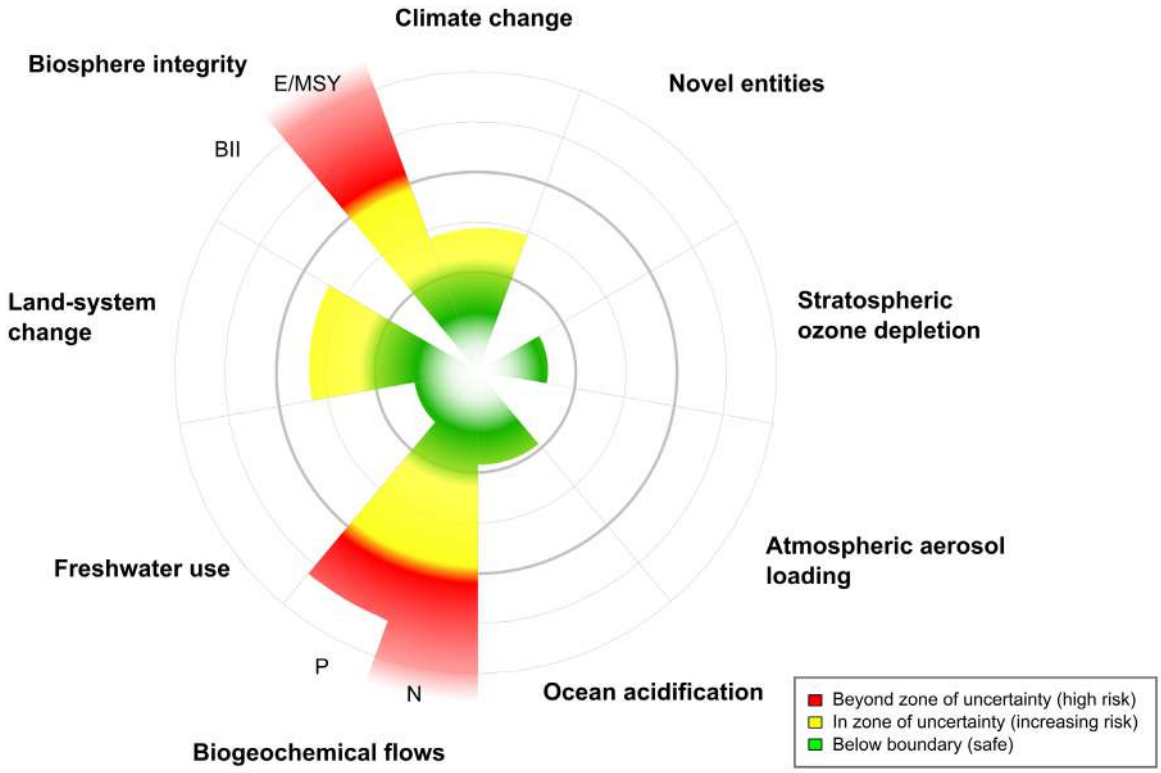


Figure 2. Nine critical Earth system processes and their boundaries. Note: P = phosphorus; N = nitrogen; BII = biodiversity intactness index and E/MSY = extinctions per million species per year. Source: From Steffen et al., 2015 SCIENCE 15 Jan 2015, Vol 347, Issue 6223, DOI: 10.1126/science.1259855. Reprinted with permission from AAAS.

sustainable development, like the word suggests, refers to the many processes and pathways used to stimulate development, or achieve progress, in sustainable ways. For example, the SDGs[ix] are global goals encouraging all countries and sectors to work in collaboration to eventually achieve sustainability by addressing challenges related to sustainable development.

In this report, we use the following working definition for sustainability:

- ***Sustainability*** *means prioritising the needs of all life forms and of the planet by ensuring that human activity does not exceed planetary boundaries*.

Planetary boundaries describe how human activities, based on fossil fuel use, cause or accelerate detrimental changes to the planet. Scientists have identified nine Earth system processes that need to be monitored and not crossed[13], such as (Figure 2): i) biosphere integrity, ii) land-use change, iii) climate change, iv) freshwater use, v) ocean acidification, vi) biogeochemical flows (nitrogen and phosphorus cycles), vii) atmospheric aerosol pollution, viii) stratospheric ozone depletion, and ix) release of novel chemicals.

2.2 Sustainability competences

In the early 2000s, several European countries started to shift their education and training systems from a knowledge- to a more competence-based approach in their national curricula.

With such a shift, experts in higher education started to map the specific competences on sustainability for students and professionals so they could become agents of change for sustainability. While in the literature there is widespread agreement over what the necessary competences for sustainability are[14,15], adopting and embedding them in lifelong learning programmes remains up to individual institutions and local educational leaders. Furthermore, research conducted so far has tended to be at the higher education level, focusing on what competences young graduates and professionals need to possess in order to contribute to sustainability challenges and opportunities[16].

GreenComp maps sustainability as a competence relevant to all ages. The sustainability competence defined by *GreenComp* unfolds into a set of sub-elements that we refer to as competences for sustainability.

GreenComp has adopted the following statement to define a sustainability competence:

- *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.*

This definition focuses on developing sustainability knowledge, skills and attitudes for learners so they can think, plan and act with sustainability in mind, to live in tune with the planet. All types of learning – formal, non-formal, and informal – are considered as vectors for developing this competence in early childhood, through harvesting it as young kids and teenagers, to putting it into context as young adults and continuously nurturing it as adults. Sustainability as a competence applies to all spheres of life, both on personal and collective levels.

2.3 Teaching and learning sustainability competences

Since emerging in the 1960s, *sustainability education* and related concepts[x] has often been associated with transformative learning[17], as it aims to

ix SDGs can be consulted here: https://sdgs.un.org/goals

x Sustainability education is used as an umbrella term for different related concepts such as environmental education, education for sustainable development, education for sustainability, and ecological education, and so forth.

profoundly change our perspectives, beliefs and behaviour through reflecting on what we know and do not know. It encourages us to question how we interpret our surroundings and the role we play in them[18]. Sustainability education aims to provide learners with sustainability competences in order to reflect and embrace sustainability in their daily lives as students, consumers, producers, professionals, activists, policymakers, neighbours, employees, teachers and trainers, organisations, communities, and society at large.

The platform provided by UN Decade of Education for Sustainable Development (DESD, 2005-2014) helped highlight this message at the global level. This led to education for sustainable development[xi] being embedded in Target 4.7 of SDG 4, whose objective is to "ensure that all learners acquire the competences, such as knowledge and skills needed to promote sustainable development". SDG 4 is understood to be a critical goal that must be achieved in order for the other 16 SDGs to be achieved.

In view of this, education is intrinsically intertwined with sustainability at all levels through competences embedded across the curriculum. It recognises how sustainability aspects (environmental, social, cultural and economic) are interrelated and how they are interlinked and embedded within disciplines and subjects. Sustainability education is then viewed in the same light as transformative learning as its aim is to change the person and the social institution through a holistic approach[19]. In this report, we refer to the pillars and principles of sustainability education through the term *learning for environmental sustainability* in line with what has been set out in the Commission's proposal for a Council recommendation on learning for environmental sustainability. Learning encompasses both education and training. We define it as the following:

- ***Learning for environmental sustainability*** *aims to nurture a sustainability mindset from childhood to adulthood with the understanding that humans are part of and depend on nature. Learners are equipped with knowledge, skills and attitudes that help them become agents of change and contribute individually and collectively to shaping futures within planetary boundaries.*

Learning for environmental sustainability has the potential to be a catalyst for change among young and adult generations, through the acquisition of sustainability competences.

xi See Bianchi, 2020, for an overview on the evolution and conceptualisation of sustainability education and education for sustainable development.

3. The European sustainability competence framework

GreenComp consists of four competence 'areas' that correspond to the definition of sustainability; and the 12 'competences' that, taken together, make up the building blocks of the sustainability competence for all people.

The two dimensions are listed in Table 1. Each competence is accompanied by a descriptor that best represents its main aspects.

Table 1. *GreenComp* areas, competences, and descriptors.

AREA	COMPETENCE	DESCRIPTOR
1. *Embodying sustainability values*	1.1 **Valuing sustainability**	To reflect on personal values; identify and explain how values vary among people and over time, while critically evaluating how they align with sustainability values.
	1.2 **Supporting fairness**	To support equity and justice for current and future generations and learn from previous generations for sustainability.
	1.3 **Promoting nature**	To acknowledge that humans are part of nature; and to respect the needs and rights of other species and of nature itself in order to restore and regenerate healthy and resilient ecosystems.
2. *Embracing complexity in sustainability*	2.1 **Systems thinking**	To approach a sustainability problem from all sides; to consider time, space and context in order to understand how elements interact within and between systems.
	2.2 **Critical thinking**	To assess information and arguments, identify assumptions, challenge the status quo, and reflect on how personal, social and cultural backgrounds influence thinking and conclusions.
	2.3 **Problem framing**	To formulate current or potential challenges as a sustainability problem in terms of difficulty, people involved, time and geographical scope, in order to identify suitable approaches to anticipating and preventing problems, and to mitigating and adapting to already existing problems.

Table 1. *GreenComp* areas, competences, and descriptors.

AREA	COMPETENCE	DESCRIPTOR
3. *Envisioning sustainable futures*	3.1 **Futures literacy**	To envision alternative sustainable futures by imagining and developing alternative scenarios and identifying the steps needed to achieve a preferred sustainable future.
	3.2 **Adaptability**	To manage transitions and challenges in complex sustainability situations and make decisions related to the future in the face of uncertainty, ambiguity and risk.
	3.3 **Exploratory thinking**	To adopt a relational way of thinking by exploring and linking different disciplines, using creativity and experimentation with novel ideas or methods.
4. *Acting for sustainability*	4.1 **Political agency**	To navigate the political system, identify political responsibility and accountability for unsustainable behaviour, and demand effective policies for sustainability.
	4.2 **Collective action**	To act for change in collaboration with others.
	4.3 **Individual initiative**	To identify own potential for sustainability and to actively contribute to improving prospects for the community and the planet.

In Table 1, competence areas and competences are numbered for ease of reference. However this does not imply a sequence of acquisition nor a hierarchy. All 12 competences are equally important: learners are encouraged to develop all of them.

The four competence areas are tightly interrelated: sustainability as a competence encompasses all four taken together. The 12 sustainability competences are also interrelated and interconnected, and should be treated as parts of a whole. While we encourage learners to acquire the 12 competences, they do not need to acquire the highest level of proficiency in all 12, nor have the same proficiency across all of them. Indeed, *GreenComp* implies that sustainability as a competence is made of 12 building blocks.

3.1 Visualisation

Figure 3 provides a visual representation of *GreenComp*. It builds on bee pollination as a metaphor for the framework where bees, flowers, nectar and beehives represent the four areas of the framework. As a simile of a highly-developed natural system, the metaphor highlights the interplay and dynamics between the four areas and 12 competences of *GreenComp*.

Bees represent the competences related to the area 'acting for sustainability': political agency, collective action, and individual initiative. Bees act as both individuals and a collective organism. Each bee plays a vital role to ensure that the colony functions while they all work together to achieve the same goal.

Flowers represent the competences related to the area 'envisioning sustainable futures': futures literacy, adaptability, and exploratory thinking. Flowers generate fruits and fruits generate seeds so life can continue.

The **beehive** represents the competences related to the area 'embodying sustainability values': valuing sustainability, supporting fairness, and promoting nature. The beehive protects and sustains the bees.

Pollen and **nectar** represent the competences related to the area 'embracing complexity in sustainability': systems thinking, critical thinking, and problem framing. Pollen and nectar attract bees to flowers, and bees transport the pollen from flower to flower while harvesting food for their colony. The interdependencies between pollen, bees and flowers ensure the survival of both plants and bees.

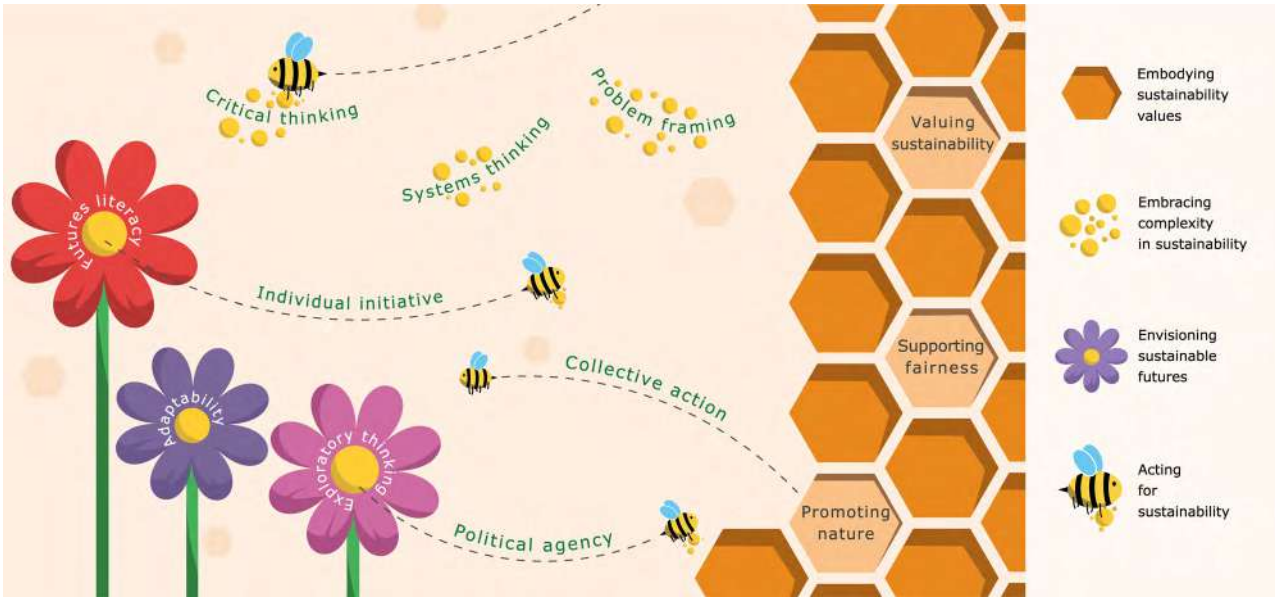


Figure 3. Visual representation of *GreenComp*.

4. Competence areas and competences

4.1 Embodying sustainability values

The competence area *'Embodying sustainability values'* encourages us to reflect on and challenge our own personal values and world-views in terms of unsustainability, and sustainability values and world-views. This area advocates equity and justice for current and future generations[xii], while supporting the view that humans are a part of nature.

Socioecological problems are wicked problems, because they involve interlinked complex systems, such as the natural systems and the social systems including technological, political and economic systems. Our understanding of such complex problems lies, at least in part, in normative assumptions of the world, and in how we interpret social, political and ethical decisions[20].

Knowledge is often seen as value-free[21], which is based on the idea that it only stems from rigorous evidence-based processes that lead to objectivity, precision, acceptability and universality[22]. Yet, our rationality is limited as our values and world-views shape our perception and understanding of the world at all times, including our perception and understanding of sustainability problems[23]. While descriptive knowledge explains reality through facts, normative knowledge on sustainability aims to identify how the world should look[24].

Sustainability competences such as systems thinking and futures literacy are useful when linked to sustainability values, as otherwise such competences could be used for unsustainable actions[25,26]. By fostering sustainability values such as equity and justice for current and future generations and preservation and restoration of nature[27], learning for environmental sustainability can help shape a more sustainable future for communities and societies.

When learners are encouraged to reflect and question knowledge acquisition, assimilate it, and put it into practice, transformative learning takes place[28]. Such learning involves cognitive (head), psychomotor (hands) and affective (heart) domains[29] and encourages reflection, questioning and action. Transformative learning is learner-centred, therefore promoting student agency[30].

4.1.1 Valuing sustainability

- **Descriptor** (1.1): *To reflect on personal values; identify and explain how values vary among people and over time, while critically evaluating how they align with sustainability values*

Valuing sustainability aims to foster reflection on values and perspectives in relation to concerns for sustainability. In this context, learners can articulate their values and consider their alignment with sustainability as the common goal.

Valuing sustainability could be defined as a meta-competence, since its primary aim is not to teach specific values, but make learners realise that values are constructs and people can choose which values to prioritise in their lives[31].

Valuing sustainability enables learners to reflect on their way of thinking, their plans, and their actions. It asks them whether these cause any harm and are in line with sustainability values and thus contribute to sustainability. It offers learners an opportunity to discuss and reflect on values, their variety and

xii Intra- and intergenerational equity and justice.

culture-dependence.

Examples of knowledge (K), skills (S) and attitudes (A):

K: *knows the main views on sustainability: anthropocentrism (human-centric), technocentrism (technological solutions to ecological problems) and ecocentrism (nature-centred), and how they influence assumptions and arguments*;

S: *can articulate and negotiate sustainability values, principles and objectives while recognising different viewpoints*;

A: *is prone to acting in line with values and principles for sustainability*.

For example: Given the apparent tensions between sustainability and consumerism based on the use of natural resources, everybody should be able to contemplate what impact buying fast fashion or taking a flight for a weekend getaway would have at system level (SDG 12).

4.1.2 Supporting fairness

- **Descriptor** (1.2): *To support equity and justice for current and future generations and learn from previous generations for sustainability*

Supporting fairness is about promoting equity and justice among present and future generations, while learning from past traditions and actions. Starting from the premise that human health is intrinsically linked to planetary health, this competence can help learners understand that environmental quality is linked to equity and justice[32]. Access to green spaces can reduce health-related socio-economic inequalities[33]. Environmental equity and justice imply, therefore, human equity and justice.

Yet *supporting fairness* is not only about promoting environmental justice and equity to improve human health. In line with the competence 'promoting nature', supporting fairness is also about taking into account the interests and capabilities of other species and environmental ecosystems, as well as the importance of preserving nature for future generations and for nature itself.

Supporting fairness as a competence can be fostered by promoting responsibility in collaborative activities and teamwork, while acknowledging and respecting other view points[34].

Examples of knowledge (K), skills (S) and attitudes (A):

K: *knows that ethical concepts and justice for current and future generations are related to protecting nature*;

S: *can apply equity and justice for current and future generations as criteria for environmental preservation and the use of natural resources*;

A: *is committed to respecting the interests of future generations*.

For example: The 'Stop Ecocide Foundation' initiative has been drafting a law on offences against the environment, or ecocide, which is defined as 'unlawful or wanton acts committed with knowledge that there is a substantial likelihood of severe and widespread or long-term damage to the environment being caused by those acts'[xiii] (SDGs 14, 15, 16). Examples of ecocide include deforestation of the Amazon or the killing of protected species.

4.1.3 Promoting nature

- **Descriptor** (1.3): *To acknowledge that humans are part of nature; and to respect the needs and rights of other species and of nature itself in order to restore and regenerate healthy and resilient ecosystems*

Promoting nature is about developing empathy towards the planet and showing care for other species. This requires knowledge about the main parts of the

xiii https://www.stopecocide.earth/legal-definition

natural environment (geosphere, biosphere, hydrosphere, cryosphere and atmosphere) and the close links and interdependence between living organisms and non-living components. Knowledge about natural phenomena can spur us on to more closely connect with nature, which in turn can motivate further learning for sustainability.

Promoting nature fosters a healthy relationship with the natural environment and aims to ignite in people a feeling of connectedness that can help contrast the psychological distress and negative emotions that children and young people worldwide experience because of climate change[35] and can help improve their mood and mental health[36].

The 'nature deficit disorder' conveys the human costs of alienation from nature: i) decreased use of the senses, ii) attention difficulties, iii) higher rates of physical and emotional illnesses, iv) a rising rate of myopia, v) increased child and adult obesity, and vi) increased vitamin D deficiency[37]. Research indicates that to overcome the 'nature deficit disorder' not only do we need to be *in contact with* nature, but we also need to *feel connected to* nature[38]. While the former involves physical interaction with the natural environment mainly at surface level, the latter concerns our feelings and views resulting from meaningful relationships being developed and the internalisation of our experiences in the natural environment, e.g. with animals, plants or places. Such internalisation can, in the long term, promote restoration of nature[39].

Examples of knowledge (K), skills (S) and attitudes (A):

K: *knows that our wellbeing, health and security depend on the wellbeing of nature*;

S: *can assess own impact on nature and consider the protection of nature an essential task for every individual*;

A: *cares about a harmonious relationship existing between nature and humans*.

For example: The Nature Conservancy – a global environmental non-profit organisation – believes that helping young people build relationships with nature (SDG 4) is critical to ensure a more sustainable future (SDGs 15, 3, 11). The Nature Lab, the Nature Conservancy's youth curriculum platform, provides educational resources for different age groups to teach them how nature works and how young people can contribute to its conservation[xiv].

4.2 Embracing complexity in sustainability

The competence area *'Embracing complexity in sustainability'* is about:

- empowering learners with systemic and critical thinking, and encouraging them to reflect on how to better assess information and challenge unsustainability;
- scanning systems by identifying interconnections and feedback; and
- framing challenges as sustainability problems which helps us learn about the scale of a situation while identifying everyone involved.

Technological change, digitisation, and globalisation have increased our society's complexity and accelerated socioecological problems such as climate change and loss of biodiversity. Environmental challenges are interconnected and interlinked to economic activities and societal lifestyles[40]. The operation of our economy, contained within our society (see Figure 4), depends on our planet which has limited resources and boundaries[41].

[xiv] The Nature Conservancy educational resources that promote nature are available at https://www.nature.org/en-us/about-us/who-we-are/how-we-work/youth-engagement/nature-lab/

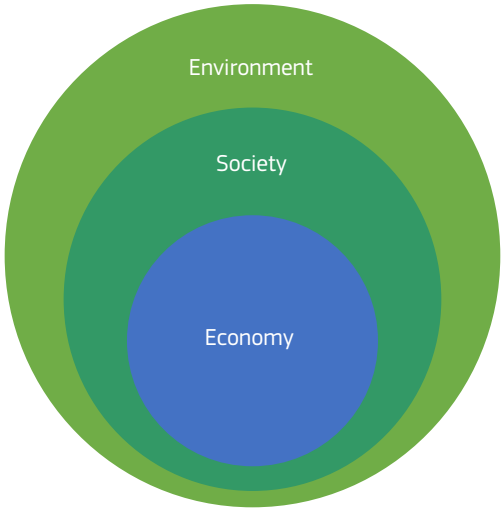


Figure 4. Interconnectedness of economy, society and environment.

Learning for environmental sustainability enables learners to be better equipped to see connections and links between specific issues and environmental change[42]. Health is a fundamental human right, and access to a 'safe, clean, healthy and sustainable environment' is also now recognised as a human right[xv]. However, minority groups and families with a lower income are often exposed to polluted environments, which in turns affects their health and wellbeing. Identifying the connections between environmental issues and income inequality, which may look unrelated at first superficially, can help us correctly frame such challenges as a sustainability problem and take preventive or mitigating actions.

4.2.1 Systems thinking

- **Descriptor** (2.1): *To approach a sustainability problem from all sides; to consider time, space and context in order to understand how elements interact within and between systems*

Equipping learners with *systems thinking* is necessary to understand complex sustainability problems and their evolution. *Systems thinking* allows us to understand reality in relation to other contexts (local, nation, global) and fields (environment, social, economic, cultural). It is critical for advancing sustainability. Thinking in systems enables learners to identify feedback mechanisms, intervention points and interactive trajectories. *Systems thinking* can be understood as a tool for evaluating options, decision-making and taking action[43]. It is based on the assumption that parts of a system act differently when taken apart from the system. In fact, contrary to this, fragmentary thinking, i.e. analysing parts in isolation, instead of the whole interconnected system, increases short-termism and could led to an oversimplification of sustainability problems which may not correspond to reality.

Examples of knowledge (K), skills (S) and attitudes (A):

K: *knows that every human action has environmental, social, cultural and economic impacts;*

S: *can describe sustainability as a holistic concept that includes environmental, economic, social, and cultural issues;*

A: *is concerned about the short- and long-term impacts of personal actions on others and the planet.*

For example: Green technologies often promise positive outcomes for sustainability, yet they may have unintended consequences when scaled up to the system level (e.g. loss of biodiversity and increased competition for land due to biofuel production)[44]. Without a comprehensive understanding of complex problems and potential solutions, such consequences could be difficult to identify (multiple SDGs).

4.2.2 Critical thinking

- **Descriptor** (2.2): *To assess information and arguments, identify assumptions, challenge the status quo, and reflect on how personal, social and cultural backgrounds influence thinking and conclusions*

xv https://www.ohchr.org/EN/NewsEvents/Pages/DisplayNews.aspx?NewsID=27635&LangID=E

Critical thinking is considered fundamental for learners 'to cope with uncertainty, complexity, and change'[45]. Critical thinking is a high-level cognitive process, which includes several skills needed for evaluating and understanding information regarding sustainability problems. This enables learners to broaden their views without taking information and information sources for granted. Eventually, learners should be comfortable when acquiring and integrating information from different disciplines[46]. A critical outlook allows learners to challenge, and change, their values, perspectives and understanding of the world[47].

Critical thinking can help empower learners to become more responsible and actively cooperate in creating a sustainable world. More specifically, stepping up critical thinking will help them go beyond just passively understanding sustainability concepts[48]. It will help them develop the ability to reflect and assess theories and assumptions.

Examples of knowledge (K), skills (S) and attitudes (A):

K: *knows sustainability claims without robust evidence are often mere communication strategies, also known as greenwashing;*

S: *can analyse and assess arguments, ideas, actions and scenarios to determine whether they are in line with evidence and values in terms of sustainability;*

A: *trusts science even when lacking some of the knowledge required to fully understand scientific claims.*

For example: A critical understanding of how fast fashion (SDG 12), poor labour conditions (SDGs 8, 10), solid waste accumulation (SDGs 11, 12) and pollution (multiple SDGs) are interrelated and underpin each other can help learners i) define the class of problems they need to deal with, ii) identify those involved, iii) adopt different perspectives, and iv) identify paths for possible solutions.

4.2.3 Problem framing

- **Descriptor** (2.3): *To formulate current or potential challenges as a sustainability problem in terms of difficulty, people involved, time and geographical scope, in order to identify suitable approaches to anticipating and preventing problems, and to mitigating and adapting to already existing problems*

Problem framing is the process of identifying actual or potential sustainability problems. It involves defining and structuring sustainability problems based on their complexity and those mainly involved. Understanding the nature of the actual or potential problems we are trying to define, e.g. from simple to wicked problems, can be a major obstacle.

Experts have identified four types of problems, based on how well defined both the problem and solution to address it are[49] (see Figure 5). Differentiating between these four types of problem can help identify appropriate solutions.

This process also entails determining whether the current situation is already a problem or has the potential to become one in the future.

Most fundamentally, *problem framing* defines what is challenging about a given situation and identifies the best action to address it, which involves systems thinking. In essence, *problem framing* helps define goals and the direction the problem solving process should take[50]. While sustainability problems are complex and often cannot be solved, appropriate steps can be taken either to anticipate and prevent them, or to mitigate and adapt them to an already existing problem.

Problem framing can help identify situations and frame them as current or potential problems for sustainability in a given context. This requires a critical understanding of socioecological systems. In turn, *problem framing* can help contextualise and define a sustainability problem in a given geographical and temporal context.

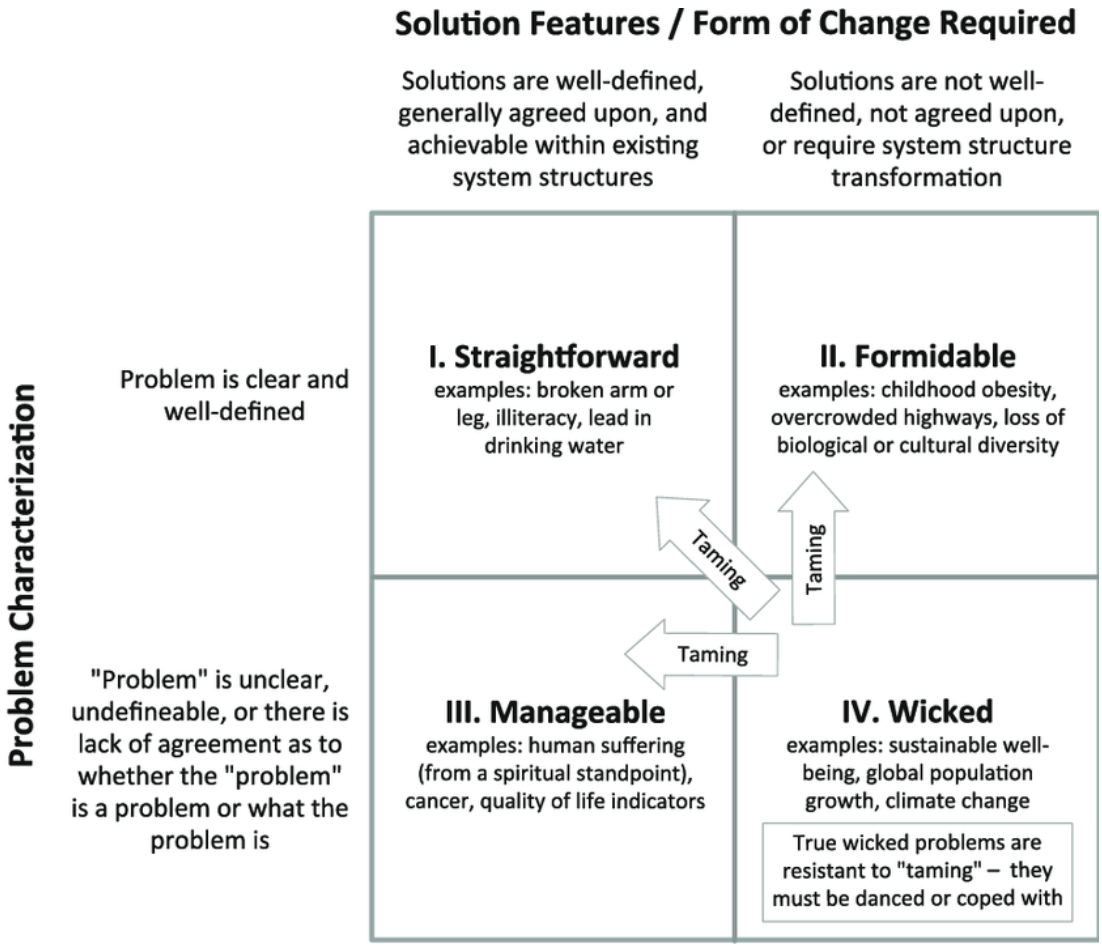


Figure 5. Problem characterisation and change required. Source: Glasser, 2018.

Examples of knowledge (K), skills (S) and attitudes (A):

K: *knows that to identify fair and inclusive actions, it is necessary to look at sustainability problems from different stakeholder perspectives;*

S: *can establish a transdisciplinary approach to framing current and potential sustainability challenges;*

A: *listens actively and shows empathy when collaborating with others to frame current and potential sustainability challenges.*

For example: The decline of bees and other pollinating insects can, for instance, be framed as a problem related to food production security requiring technical solutions in terms of agricultural management (SDG 12) as opposed to a problem with maintaining the renewal of nature threatened by the overuse of its resources (SDGs 15, 12).

4.3 Envisioning sustainable futures

The competence area *'Envisioning sustainability futures'* enables learners to visualise alternative future scenarios and identify actions to achieve a sustainable future. It is essential that learners acquire the competence of 'adaptability' while coping with uncertainty about the futures and trade-offs in sustainability. Applying creative and transdisciplinary approaches to our way of thinking can foster a circular society and encourage learners to use their imagination when thinking about the future.

Learning for environmental sustainability encourages people to move away from looking for certainties but rather think about possibilities. It is fundamental that learners understand the future as open and something that can be shaped collectively. This requires the ability to analyse the present time and understand that it comprises complex systems interacting and influencing current and future trajectories, which in turn are influenced by our values, world-views and experiences.

Creativity, imagination and being aware of our emotions and intuitions can inform our ability to envision alternative futures[51]. Learners are encouraged to use a combination of 'logical analysis and disciplined imagination'[52]. Information from several disciplines and traditions has the potential to help people make more informed plans and decisions in a complex society[53]. This can help learners identify steps and explore plans to collectively shape a resilient and regenerative planet.

Therefore, learners are advised to think of a wide range of possible future outcomes and envision alternative future scenarios for sustainability. By becoming comfortable with the notion of multiple futures, learners can acknowledge:

i. the uncertainty about the future as a given, rather than assuming or denying it;

ii. that it is impossible to know what will happen and thus the idea of trying to control what will happen will be rejected;

iii. that they need to identify probable, alternative, and preferred futures;

iv. that they need to influence and shape the trajectory towards a (collective) preferred future.

4.3.1 Futures literacy

- **Descriptor** (3.1): *To envision alternative sustainable futures by imagining and developing alternative scenarios and identifying the steps needed to achieve a preferred sustainable future*

Futures literacy empowers learners to create their visions for a sustainable future by providing them with the knowledge, skills and attitudes to understand the futures as a variety of alternatives. Research commonly differentiates between three approaches in order to understand the futures:

- expected future, i.e. what we expect to happen based on what it is happening today and what we know, e.g. business as usual;
- alternative future(s), i.e. what will happen may differ from expectations, e.g. creation of green jobs that currently do not exist;
- preferred future, i.e. we may envision a sustainable future for us, our community and our planet, and identify the steps and actions needed to achieve that future[54], e.g. a circular economy.

Through *futures literacy*, learners can anticipate, prepare and invent as changes occur[55]. *Futures literacy* encourages learners to i) use their imagination when thinking about the future, ii) tap into their intuitions and creativity, and iii) assess the possible steps needed to achieve their preferred future. By using real-life experiences, learners can be taught in futures methodologies that adopt qualitative and/or quantitative research methods.



Examples of knowledge (K), skills (S) and attitudes (A):

K: *knows the difference between expected, preferred and alternative futures for sustainability scenarios*;

S: *can envisage alternative futures for sustainability that are grounded in science, creativity and values for sustainability*;

A: *is aware that the projected consequences on self and community may influence preferences for certain scenarios above others*.

For example: Prompting 'futures literacy' as a life skill for students and educators (SDG 4) is the mission of the global non-profit organisation Teach the Future. Thanks to their resources for lifelong learning, learners can imagine more sustainable futures, where, for example, communities have access to clean water, clean energy and healthy food (multiple SDGs including 6, 7, 2).

4.3.2 Adaptability

- **Descriptor** (3.2): *To manage transitions and challenges in complex sustainability situations and make decisions related to the future in the face of uncertainty, ambiguity and risk*

Adaptability is about being flexible and able to adapt to new situations and adjust in order to accommodate changes in our complex world[56]. It is essential that learners be able to cope with uncertainty about the future and the ambiguity of wicked sustainability problems and how they may evolve. *Adaptability* should provide learners with the ability to cope with trade-offs in sustainability e.g. environmental impacts and social outcomes as well as economic aspects. Moreover, learners should feel empowered to consider options and make decisions even when facing contradictions and risks in terms of the future[57].

People can learn in order to acquire knowledge, which may result in them changing their opinions and behaviour, and learning to manage their emotions[58]. For cognitive adaptability, this might involve better teaching people about the significance of a changing climate. For behavioural adaptability, this might involve promoting positive and constructive actions among young people that support and sustain the environment, such as saving energy, recycling, harnessing clean energy, controlling water use, and encouraging others at home and at school to do the same things.

Examples of knowledge (K), skills (S) and attitudes (A):

K: *knows that human actions may have unpredictable, uncertain and complex consequences for the environment*;

S: *can take into account local circumstances when dealing with sustainability issues and opportunities*;

A: *is willing to discontinue unsustainable practices and try alternative solutions*.

For example: Young people play a central role in driving the adaptation agenda. On 22 January 2021, young people from over 115 countries launched 'Adapt for our Future' a global youth call to action on adaptation. This initiative aims to prepare younger generations for the transition towards green and climate resilient development[xvi] (SDG 13).

4.3.3 Exploratory thinking

- **Descriptor** (3.3): *To adopt a relational way of thinking by exploring and linking different disciplines, using creativity and experimentation with novel ideas or methods*

Exploratory thinking aims to foster creativity in order to envision alternative futures. By tapping

[xvi] The call for action is available at https://klimaatadaptatiegroningen.nl/en/young-people-call-on-world-leaders-to-adapt-for-the-future

into different disciplines, traditions and cultures in a transdisciplinary manner, exploratory thinking can help learners create future visions for a circular economy (SDG 12) and society (SDG 11). To move away from linear production and consumption patterns to circular ones, we need a combination of creative thinking and experimentation with new ideas and new approaches.

As innovations that help achieve a circular economy will change our society, they will also entail new ways of social interaction and new cultural practices. For example, online platforms for people to swap their clothes and share their cars, and avoid food waste.

Exploratory thinking therefore requires cognitive processes and for people to use their intuition. The issues covered and the pedagogical approaches taken in education on sustainability encourage learners to develop abilities in creative thinking, according to assertions emphasising the close links between the two[59].

Examples of knowledge (K), skills (S) and attitudes (A):

K: *knows that sustainability problems must be tackled by combining different disciplines, knowledge cultures and divergent views to initiate systemic change*;

S: *can synthesise sustainability-related information and data from different disciplines*;

A: *is committed to considering sustainability challenges and opportunities from different angles*.

For example: 'Reduce, reuse, recycle' is a well-known concept for the circular economy, and an exploratory thinking approach can help turn waste into a precious resource. The Eco-Schools programme has developed a number of trash hack ideas that can help explore the issue of waste from different perspectives[xvii] (SDG 12).

xvii https://www.ecoschools.global/trash-hack-ideas

4.4 Acting for sustainability

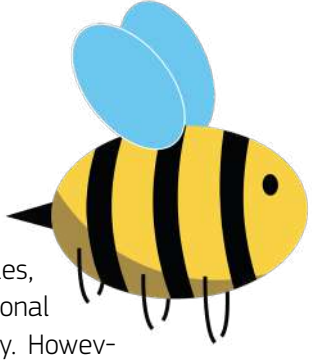
Acting for sustainability encourages learners to take action at individual and collective level to shape sustainable futures, to the extent possible. It also invites learners to demand action from those responsible to make change happen.

The last four decades have been warmer than any preceding one since 1850[60] and given the increase in human activities, this trend is unlikely to revert unless we take action to achieve systemic transformations.

Necessary transformations for sustainability are not only enabled by technological changes, but also by cultural and social changes, as well as behavioural shifts and institutional reforms[61]. As such, a plethora of stakeholders at local level must be actively engaged to shape and achieve global transformations for a more sustainable planet[62,xviii]. Individuals make everyday decisions, which have impacts and consequences for sustainability, whether they are, e.g. students, consumers, producers, employees, policymakers, or representatives of organisations or communities. Altogether, these individuals can work together to create new paradigms that can lead to global sustainability[63] through their individual initiatives, engagement and collaboration at community or regional level, or through global partnerships to achieve the SDGs.

A sustainable planet cannot be achieved by small, one-off actions on their own; a consistent and long-term approach is required[64]. For example, decisions on which type of mobility (SDG 11) we use or about what energy providers we use for our home and office buildings (SDG 7) will have an impact on the environment. In particular, circular products are made to last longer and be easier to repair by

xviii For example, the JRC is currently developing innovation strategies for sustainability (S4), a new generation of development strategies for cities, regions and countries building on and substantially extending the smart specialisation approach. See more at: https://s3platform.jrc.ec.europa.eu/s4



increasing their durability, reusability, upgradability and reparability[65] (SDG 12).

Acting for sustainability should, however, include as its enabling counterpart the willingness of the decision-makers to share their capacity to make decisions, so that the activities of learners can have an actual impact.

Examples of action that people can take individually, within their communities[66] include: voting for candidates who support the environment, volunteering, meeting local council members, launching capacity-building programmes and initiating collective action.

Learning for environmental sustainability can help us, as individuals, to identify steps, mechanisms, and actions and, as a *reflective, determined and caring*[67] society, to reduce our impact on the environment (environmental footprint[xix]). Furthermore, it can help us increase our positive contributions to the environment[68]. Learning for environmental sustainability can help equip all individuals with knowledge, skills and attitudes to think, plan, and take or request action for sustainability (SDG 4 target 4.7).

4.4.1 Political agency

- **Descriptor** (4.1): *To navigate the political system, identify political responsibility and accountability for unsustainable behaviour, and demand effective policies for sustainability*

Political agency is the capacity to positively influence the collective future, by mobilising those at political level to take action for change. Political agency requires the capacity to analyse the context, spot possible avenues to move the sustainability agenda forward, and identify key stakeholders that can be brought on board to help achieve sustainability.

Political agency can be focused towards advocating for a change in norms, rules, regulations, and institutional commitment for sustainability. However, it can also be directed towards the market and can push for green innovation or the promotion of lifestyle and behavioural changes. The green transition is one of the EU's top strategic priorities, and the role of governments in meeting the associated challenges has become increasingly important. Many Europeans demand action to tackle sustainability problems from those responsible for making and implementing policies, who are ultimately responsible for our future and that of future generations. When asked who is responsible for tackling climate change, Europeans from 17 Member States ranked national governments first, while those from five Member States ranked business and industry first, and those from the other five Member States ranked the EU itself first[69].

Political agency empowers learners to become agents of change and take part in a discussion that affects their futures. Furthermore, it shows learners that small actions can have widespread global repercussions and that by engaging others with ideas and activities that trigger reflection, everyone can contribute to political agency.

Examples of knowledge (K), skills (S) and attitudes (A):

K: *knows policies that assign responsibility for environmental damage (e.g. 'polluter pays')*;

S: *can identify relevant social, political and economic stakeholders in one's own community and region to address a sustainability problem*;

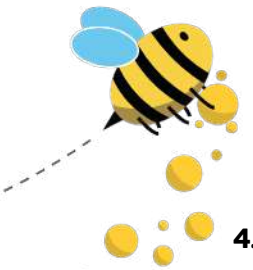
A: *demands political accountability for unsustainable behaviour*.

For example: Grassroots examples of young people, who have been especially vocal in demanding political action by governments, include the Friday for Future movement[xx] and Extinction Rebellion[xxi] (SDGs 13, 16).

xix People can calculate the environmental impacts of their consumption patterns at https://eplca.jrc.ec.europa.eu/ConsumerFootprint.html

xx https://fridaysforfuture.org/

xxi https://rebellion.global/



4.4.2 Collective action

- **Descriptor** (4.2): *To act for change in collaboration with others*

Collective action as a competence stems from recognising that the role communities and civil society organisations play in achieving sustainability is fundamental[70]. *Collective action* calls for coordination, collaboration and cooperation among peers. By acting together and working to achieve the same goal, people can find opportunities and meet challenges to contribute effectively to solving sustainability problems at the local level. Taken together, this will have an impact at the global level.

Collective action develops learners' 'ability and will to take part in democratic processes concerning man's use of and dependence on natural resources in a critical way'[71].

Examples of knowledge (K), skills (S) and attitudes (A):

K: *knows how to work with diverse participants to create inclusive visions for a more sustainable future*;

S: *can create transparent, inclusive and community-driven processes*;

A: *is willing to engage with others to challenge the status quo*.

For example: Collective action in the digital age has increased and is enabled through technology, e.g. the European Education for Climate Coalition[xxii], a digital platform that enables members of a community of practice to decide collectively, act collaboratively, and co-create solutions for sustainability (SDG 13).

4.4.3 Individual initiative

- **Descriptor** (4.3): *To identify own potential for sustainability and to actively contribute to improving prospects for the community and the planet*

Individual initiative relies on someone knowing what types of action are possible, having confidence in their own potential to influence change (internal locus of control), and being willing to act[72].

Recognising what types of action are possible and being aware of one's own potential in terms of sustainability problems are the first steps someone needs to take in order to seize the initiative as an individual. However, individual initiative does not only rely on opportunities for action and someone's self-awareness and self-efficacy. It also has a strong attitudinal aspect – the willingness to act.

Individual initiative nurtures the entrepreneurial mindset of individuals and empowers them take the initiative in their lives[73]. By taking action in their personal sphere, individuals can act as agents of change and role models, inspiring their peers to try to achieve sustainability. This could also help debunk myths on behaviour related to sustainability, e.g. a sustainable lifestyle is more expensive than a non-sustainable one, and of a lower quality.

Furthermore, *individual initiative* encourages people to take preventive action when certain actions or inaction may have damaging consequences for human health and all life forms (precautionary principle)[74]. Rather than waiting for evidence in order to act, in case of uncertainty it may be advisable to act because it may be too harmful, or too late, to wait for evidence to emerge[75, 76].

Examples of knowledge (K), skills (S) and attitudes (A):

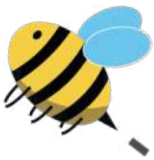
K: *knows that preventive action should be taken when certain actions or inaction may damage human health and all life forms (precautionary principle);*

S: *can act promptly, even in the face of uncertainty and unforeseen events, keeping in mind the precautionary principle;*

xxii https://education-for-climate.ec.europa.eu/community/home

A: *is confident about anticipating and influencing sustainable changes.*

For example: Courses, such as 'Knowledge to Action' as part of the International Master's programme in Environmental and Sustainability at Lund University, offer learners a hands-on opportunity to interact in real-world settings with those at societal level such as municipalities, organisations, companies and third sector organisations while taking part in a project that promotes sustainability[xxiii] (SDGs 16, 13).



xxiii Projects developed in the 'Knowledge to Action' course are available at https://www.lumes.lu.se/article/2019-knowledge-action-projects and include information on different competences developed in such an experiential learning activity.

5. Ways forward

High-quality and inclusive education and training can help improve social and environmental conditions. Socioecological problems, such as biodiversity loss, climate change, pollution and inequalities, can prevent access to education and employment. This in turn aggravates such socioecological issues in a vicious cycle[77].

Sustainable lifestyles require a shift in mindset and behaviour. We must put equity and justice for current and future generations at the heart of our societies. Our relationship with the environment must be based on a sense of being connected with nature. Learning for environmental sustainability should empower individuals to think holistically and question the world-views underpinning our current economic system. At the same time, it should encourage them to take action individually and with others to transform our society and shape sustainable futures for everyone. Lifelong learning should incorporate sustainability competences across disciplines to train the systemic thinkers and ethical agents for change who are needed to promote a sustainable society[78].

GreenComp offers a definition of what it takes to think and act sustainably, individually and collectively. The consulted stakeholders have noted that not only policymakers and education and training providers need such a definition, but also the private sector and employers at large.

Like the other EU competence frameworks, *GreenComp* is non-prescriptive. It provides a conceptual reference model that everyone involved in lifelong learning can use with various objectives in mind, such as:

- raising awareness about the importance of learning for environmental sustainability;
- designing learning opportunities aimed at developing sustainability competences; and
- assessing where one stands in supporting learners to develop sustainability skills.

Based on the take-up of other EU competence frameworks, it can be expected that the below stakeholders may use *GreenComp* for various purposes:

- National, regional and local policymakers may refer to *GreenComp* in their policies and work programmes aimed to advance learning for environmental sustainability.
- Formal and non-formal education and training providers may find *GreenComp* useful to shape their educational offer at general, vocational, higher and adult education level.
- Initial teacher training and continued professional development providers may refer to it when preparing teachers and educators to teach such sustainability competences.
- Assessment and certification services could generate new certificates that acknowledge the competences described in *GreenComp*.
- Employers may find it relevant to incorporate sustainability competences in their recruitment strategies or talent development programmes.
- Those monitoring human capital development at national or international level for statistical/measurement purposes may use it to refine current indicators or develop new ones.
- Research bodies may use *GreenComp* for empirical research on how frameworks affect educational outcomes or to determine which pedagogies are best suited for learners to develop *GreenComp* competences.
- Providers of occupational descriptions or professional qualifications and standards may find *GreenComp* useful for updating job profiles or creating new ones.

These are but examples of potential uses of *GreenComp*, which – like any other EU competence framework – is not binding. Its take-up will depend on its relevance and usefulness for each potential stakeholder group.

Key questions are which pedagogies to use and how to incorporate the learning outcomes in them. Examples of pedagogical practices that can be effective in developing the competences set out in *GreenComp* include:

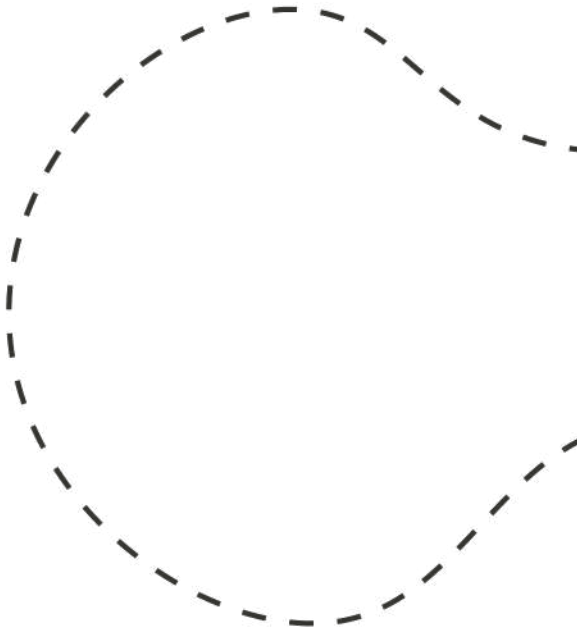
- active learning;
- student-centred, design-based, project-based, transformative (situated) learning contexts;
- gamification;
- role plays, experimental games and simulations;
- analysis of real-world case studies taken from the local context;
- blended and online learning;
- project-based learning;
- outdoor approaches; and
- collaborative approaches (cooperation with external partners).

Experts and stakeholders consulted in this process have stressed the need to factor in the context, such as the education level, the school environment, and the local community. Teaching approaches can incorporate digital technologies to support people in acquiring competences. At the same time, they must take into account the impact of digital technologies on sustainability.

Experiencing sustainability (experiential learning) is essential to stimulate a change in mindset. This can in turn promote a change in production and consumption patterns. A good example of this is promoting good practice on reducing waste, reusing, repairing or sharing among learners.

A whole school approach should also be considered. Teaching and learning for sustainability during everyday activities and across disciplines is challenging. Schools could choose to develop a sustainability culture and support professional learning. A whole school approach can make it easier for schools and can support organisational change.

The take-up of *GreenComp* in lifelong learning for sustainability is highly encouraged. At the same time, it is highly recommended to adapt the framework to learners' needs and backgrounds, and to the context.



Glossary

Attitudes	Attitudes are motivators of performance. They include values, aspirations and priorities.
Competence	In the context of GreenComp, competence is understood as a set of knowledge, skills and attitudes.
Complex system	A complex system is a system composed of many components which interact with each other in ways that are very difficult to model due to the types of relations among such components (dependency, competition, relationships between their parts or between a given system and its environment).
Formal learning	Learning that occurs in an organised and structured environment, such as in an education or training institution, or on the job, and is explicitly designated as learning. Formal learning is intentional and typically leads to certification.
Informal learning	Learning that results from daily activities related to work, family or leisure. It is not organised or structured and in most cases unintentional from the learner's perspective.
Knowledge	Knowledge is the outcome of the assimilation of theoretical or factual information by learning. Knowledge is the body of facts, principles, theories and practices that is related to a field of work or study.
Learning for environmental sustainability	In the context of GreenComp, learning for environmental sustainability aims to nurture a sustainability mindset from childhood to adulthood with the understanding that humans are part of and depend on nature. Learners are equipped with knowledge, skills and attitudes that help them become agents of change and contribute individually and collectively to shaping futures within planetary boundaries.
Learning outcomes	Learning outcomes are statements of what a learner knows, understands and is able to do after completion of learning.

Lifelong learning	Learning activities undertaken throughout life, to expand or improve competences, knowledge, skills and qualifications for personal, social and professional reasons.
Non formal learning	Learning that is embedded in planned activities not explicitly designated as learning, but which contains an important learning experience. Non-formal learning is intentional and typically does not lead to certification.
Planetary boundaries	Planetary boundaries refer to nine processes. These regulate the stability and resilience of the Earth system and the evidence-based limits within which humanity can stay safe, develop and thrive for generations to come[xxiv].
Planned obsolescence	Planned obsolescence refers to a wide range of techniques that manufacturers might use to shorten the functional lifespan of products. In doing so, they force consumers to make premature replacements and can continue selling in saturated markets[xxv].
Precautionary principle	The precautionary principle is an approach that suggests to take precautionary measures, such as avoidance or mitigation, to innovations that could potentially cause harm and on which extensive scientific knowledge is lacking.
Skills	Skills means the ability to apply knowledge and use know-how to complete tasks and solve problems. Skills can be cognitive (involving the use of logical, intuitive and creative thinking) or practical (involving manual dexterity and the use of methods, materials, tools and instruments).
Sustainability	In the context of GreenComp, sustainability means prioritising the needs of all life forms and of the planet by ensuring that human activity does not exceed planetary boundaries.
Sustainable Development Goals	The Sustainable Development Goals (SDGs) are 17 global goals published by the United Nations in 2015. They aim for all countries and sectors to work in partnership to address key sustainable development challenges by 2030[xxvi].

xxiv https://www.stockholmresilience.org/research/planetary-boundaries.html

xxv https://www.europarl.europa.eu/RegData/etudes/BRIE/2016/581999/EPRS_BRI(2016)581999_EN.pdf

xxvi https://ec.europa.eu/info/publications/reflection-paper-towards-sustainable-europe-2030_en

Transformative learning	Transformative learning goes beyond acquiring skills and knowledge. It helps learners reflect on how they acquire and frame knowledge. It also helps them become aware and critical of their own and others' assumptions. This can lead to changes in thinking, perceptions, beliefs and values, which can transform how learners interpret the world around them.
Wicked problem	A wicked problem is a problem or policy issue that is difficult to solve because it is complex and ill structured. It entails several incomplete, intractable, controversial, contested and evolving requirements that are difficult to recognise or link. It often has no single solution.

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Appendix 1. – Use cases

The below use cases aim to show how the 12 sustainability competences come into play when facing challenges. Given that every action has an impact on the planet and all life forms, every challenge is a sustainability challenge. These use cases show how the 12 sustainability competences are interrelated and equally important. We encourage the development of all 12 sustainability competences, yet the proficiency level in each of them can vary depending on learners' backgrounds, needs, and context.

Use case 1

Fatima is a school teacher, who cares a lot about her pupils and would like to take them out for outdoor learning. She knows they would benefit from spending more time in nature (***promoting nature***). However, she finds this impossible, due to the dire state of the natural surroundings in her community, including its important river. In fact, locals would rather travel to other places outside their region to be in nature. Because of her investigative attitude (***critical thinking***; ***exploratory thinking***), Fatima decided to approach this challenge as a sustainability problem (***problem framing***; ***valuing sustainability***). Not only is the area underused, people also make pollution levels worse when taking the car or flying to other and more distant places.

These days, the river is polluted with toxic waste from the industrial district nearby, and household waste, such as plastics. The surrounding area resembles a landfill and requires restoration. The local community stays away from this part of the region, especially families and women. The abandoned state of this area conveys a sense of unsafety and lack of healthy conditions. The decline of the place is also associated with potential crime (***systems thinking***).

Despite its current state, Fatima believes this vast area has huge potential:

- she envisions families having picnics at weekends;
- schools could organise educational excursions;
- the river offers potential for many sport activities, such as rowing or kayaking;
- people could enjoy nature without having to travel far, and could spend their days off there.

Furthermore, future generations, as well as other species could benefit from a healthy environment (***supporting fairness***). This is her vision (***futures literacy***; ***values thinking***). She is motivated to achieve this vision for her community, if members of her community share the same vision (***collective action***).

With her vision in mind, she started mapping the root causes of the current sustainability problem related to this green area. She identified direct and indirect causes, underlined man made causes and classified them by reversibility and complexity (***systems thinking***; ***problem framing***; ***individual initiative***). To get a broader picture, Fatima asked town council employees for help. They are responsible for the area and know who and what the main sources of pollution are (***collective action***; ***political agency***).

Starting with this information, she explored new avenues for change for her community, for example by focusing on local businesses and finding incentives to build a local, circular economy hub. This could help to make sustainable use of resources and avoid the use of toxic substances (***exploratory thinking***). She already knows that more sustain-

able practices are available than those currently in use nearby. Furthermore, the workforce would need to be upskilled. At the same time, people would need to adopt greener lifestyles, such as reducing their use of single-use plastic, eventually cutting it out altogether, and using green spaces while walking more. Related to this, public and private investment should prioritise the roll-out of shared green transport both for households and businesses.

Fatima knows that leading by example is an effective way to build trust and inspire young kids. So, even if quite reluctantly at first, she stopped driving her car and started to commute to school by bus (***adaptability***). Together with some parents, she petitioned the school canteen to make meals vegetarian, with one vegan option per day (***political agency***; ***collective action***). She is not, or at least not yet, a vegetarian (***adaptability***). Once on a Saturday morning, she organised a treasure hunt for the whole community. The prize for collecting the most litter included tools to promote pollinator conservation, such as daisy flower plants and gardening tools – second-hand and shared by the community.

Use case 2

Alex has just started his fourth year of high school in the south of Europe. Alex is not originally from the area, so volunteering activities helped him integrate into the community. They enable him to support the community he is growing up in (***supporting fairness***; ***individual initiative***) while restoring local parks (***promoting nature***). For example, together with other volunteers, Alex recently restored the park of a primary school in a less advantaged neighbourhood. Now, kids can use it again to create their own gardens and enrich local flora and fauna (***collective action***).

Lately, he has been feeling discomforted by the state of the planet. He learnt on social media that he was experiencing eco-anxiety. Frustrated by the idea of inaction, last week, he signed up for a laboratory at school (***individual initiative***). It is entitled *Are we on track to achieve the SDGs by 2030?* In groups, learners focus on various SDGs. Each group examines their assigned SDGs, including targets and indicators. They explore the implications and current achievement of those SDGs at their community level. Finally, they need to identify and agree on steps, action and policy recommendations for their community to achieve those SDGs by 2030.

His group was assigned SDG 12 – responsible production and consumption. Eager to start, Alex and his teammates performed a web search for more facts and figures on SDGs and best practices on SDG 12 (***systems thinking***; ***critical thinking***).

Inspired by young people worldwide taking action for the planet, they decided to reflect on how they would envision their community in the future (***futures literacy***; ***valuing sustainability***). They created a vision anchored in sustainability principles, such as:

- equity and justice for the present and future generations (***supporting fairness***); and
- the restoration of nature to limit global warming to 1.5 °C compared to pre-industrial levels (***promoting nature***).

They envision their community transitioning to a circular model, where inclusiveness and safety are promoted, together with responsible production and consumption. However, their community is still far from becoming circular. This poses a serious problem to the health and wellbeing of the community and local natural ecosystem, and it also exacerbates inequalities (***problem framing***). They are aware that reducing waste is one of the main pillars of the circular economy (***exploratory thinking***). Therefore, they adopted a systemic way of thinking to trace causes and place the challenge in context (***systems thinking***).

To reduce waste in the community, they drafted a strategy linked to the goals of the waste hierarchy (see Figure 6)[xxvii].

Starting with the most urgent activities, they decided to partner with schools to introduce educa-



Figure 6: waste hierarchy. Source: Waste Framework Directive 2008 https://ec.europa.eu/environment/topics/waste-and-recycling/waste-framework-directive_en

tional activities. For example, senior students could help younger ones to separate waste correctly and **recycle** waste (***individual initiative***). Learners would then pass on this knowledge to their families. Alex and his teammates would also organise a clean-up of the parks surrounding their school together with members of the community (***collective action***). Afterwards, they would send pictures and a signed letter to the local council to request preventive action to avoid littering in the future (***political agency***).

They would set up a clothes exchange with their friends to encourage people to **reuse** resources **and reduce** resource consumption. This would enable them to share and exchange clothes, fulfilling their pledge to reduce their consumption of fast fashion (***exploratory thinking***). Alex has always loved new things and has been taught by society that clothes form part of his identity. Nevertheless, he knows he should reconsider his priorities (***valuing sustainability***; ***critical thinking***) and find satisfaction from other things (***adaptability***). If this model were successful, they could then look for ways to extend it to include the whole community. At the same time, they would keep in mind that travelling to exchange clothes should remain minimal and green.

Finally, they would promote waste prevention in the long term. They would ask policymakers to discourage businesses from designing products with a short lifespan (planned obsolescence), and encourage people to consume less and better.

[xxvii] Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives.

Appendix 2. – Knowledge, skills and attitudes (KSA) statements

Table 2: valuing sustainability.

Embodying sustainability values		
1.1 **Valuing sustainability**		To reflect on personal values; identify and explain how values vary among people and over time, while critically evaluating how they align with sustainability values.
KSA		*Statements*
Knowledge	1	Knows the main views on sustainability: anthropocentrism (human-centric), technocentrism (technological solutions to ecological problems) and ecocentrism (nature-centred), and how they influence assumptions and arguments.
	2	Knows the main values and principles underpinning socio-economic models and their relation to sustainability.
	3	Knows that values and principles influence action that can damage, does not harm, restores or regenerates the environment.
	4	Knows that various cultures and generations may attach more or less importance to sustainability depending on their value systems.
	5	Knows that when human demand for resources is driven by greed, indifference and unfettered individualism, this has negative consequences for the environment.
	6	Knows how one's position in society influences personal values.
Skills	1	Can critically assess and compare underlying sustainability values and principles in arguments, action, policies and political claims.
	2	Can evaluate issues and action based on sustainability values and principles.
	3	Can bring personal choices and action in line with sustainability values and principles.
	4	Can articulate and negotiate sustainability values, principles and objectives while recognising different viewpoints.
	5	Can identify and include values of communities, including minorities, in problem framing and decision making on sustainability.
Attitudes	1	Is prone to acting in line with values and principles for sustainability.
	2	Is willing to share and clarify views on sustainability values.
	3	Is open-minded to others and their world-views.
	4	Is ready to critique and value various cultural contexts depending on their impact on sustainability.

Table 3: supporting fairness.

Embodying sustainability values		
1.2 **Supporting fairness**	To support equity and justice for current and future generations and learn from previous generations for sustainability.	
KSA		*Statements*
Knowledge	1	Knows that ethical concepts and justice for current and future generations are related to protecting nature.
	2	Knows about environmental justice, namely considering the interests and capabilities of other species and environmental ecosystems.
	3	Knows the importance of preserving nature for future generations for its own sake.
	4	Knows that individuals and communities differ in how and how much they can promote sustainability.
Skills	1	Can apply equity and justice for current and future generations as criteria for environmental preservation and the use of natural resources.
	2	Can assess and question personal needs to carefully manage resources in the pursuit of longer-term goals and common interests.
	3	Can respect, understand and appreciate various cultures in relation to sustainability, including minority cultures, local and indigenous traditions and knowledge systems.
	4	Can help build consensus on sustainability in an inclusive manner.
Attitudes	1	Is committed to decreasing material consumption.
	2	Has a sense of belonging to a common humanity and of solidarity with future generations.
	3	Is committed to respecting the interests of future generations.

Table 4: promoting nature.

Embodying sustainability values		
1.3 **Promoting nature**	To acknowledge that humans are part of nature; and to respect the needs and rights of other species and of nature itself in order to restore and regenerate healthy and resilient ecosystems.	
KSA		*Statements*
Knowledge	1	Knows about the main parts of the natural environment (geosphere, biosphere, hydrosphere, cryosphere and atmosphere) and that living organisms and non-living components are closely linked and depend on each other.
	2	Knows that our wellbeing, health and security depend on the wellbeing of nature.
	3	Knows that people are part of nature and that the divide between human and ecological systems is arbitrary.
	4	Knows that humans shape ecosystems and that human activities can rapidly and irreversibly damage ecosystems.
	5	Knows that damaging and exhausting natural resources can lead to disasters and conflicts (e.g. loss of biodiversity, draughts, mass migration and war).
	6	Knows about the need to decouple production from natural resources and wellbeing from consumption.
Skills	1	Can assess own impact on nature and consider the protection of nature an essential task for every individual.
	2	Can see and imagine humans living together and respecting other life forms.
	3	Can acknowledge cultural diversity within planetary limits.
	4	Can find opportunities to spend time in nature and helps to restore it.
	5	Can identify processes or action that avoid or reduce the use of natural resources.
Attitudes	1	Cares about a harmonious relationship existing between nature and humans.
	2	Is critical towards the notion that humans are more important than other life forms.
	3	Shows empathy with all life forms.
	4	Is appreciative of nature's role in our wellbeing, health and security.
	5	Continuously strives to restore nature.

Table 5: systems thinking.

Embracing complexity in sustainability		
2.1 **Systems thinking**	To approach a sustainability problem from all sides; to consider time, space and context in order to understand how elements interact within and between systems.	
KSA		*Statements*
Knowledge	1	Knows that every human action has environmental, social, cultural and economic impacts.
	2	Knows that human action influences outcomes across time and space, leading to positive, neutral or negative results.
	3	Knows about life cycle thinking and its relevance for sustainable production and consumption.
	4	Knows the main concepts and aspects of complex systems (synthesis, emergence, interconnectedness, feedback loops and cascade effects) and their implications for sustainability.
	5	Knows the United Nations SDGs and is aware of interconnections and possible tensions between individual goals.
Skills	1	Can describe sustainability as a holistic concept that includes environmental, economic, social, and cultural issues.
	2	Can assess interactions between environmental, economic, social, and cultural aspects of sustainability action, events and crises (e.g. migration caused by climate change or wars caused by resource scarcity).
	3	Can assess how humans and nature interact across space and time.
	4	Can use life cycle thinking to analyse the risks and benefits of human action.
	5	Can identify in a system those challenges and opportunities that have the greatest potential to trigger change for sustainability.
Attitudes	1	Acknowledges the root causes of unsustainability for which humans are responsible, such as climate change.
	2	Has a holistic grasp of connections and interactions between natural events and human actions.
	3	Is concerned about the short- and long-term impacts of personal actions on others and the planet.
	4	Cares about systemic consequences of environmental crises for current and future generations and for other species.
	5	Is concerned about unpredictable cascade effects of human action.

Table 6: critical thinking (*LifeComp).

Embracing complexity in sustainability		
2.2 **Critical thinking**	To assess information and arguments*, identify assumptions, challenge the status quo, and reflect on how personal, social and cultural backgrounds influence thinking and conclusions.	
KSA		*Statements*
Knowledge	1	Knows that our understanding of sustainability is always evolving.
	2	Knows that various biases can influence the discourse on sustainability, including reasoning, communication and political narratives.
	3	Knows that predominant narratives can shape the formulation of sustainability problems.
	4	Knows sustainability claims without robust evidence are often mere communication strategies, also known as greenwashing.
	5	Knows that tackling unsustainable patterns requires challenging the status quo, at individual and collective level, by organisations and in politics.
Skills	1	Can apply personal reasoning to address criticism and arguments on sustainability matters.
	2	Can analyse and assess arguments, ideas, actions and scenarios to determine whether they are in line with evidence and values in terms of sustainability.
	3	Can scrutinise information sources and communication channels on sustainability to assess the quality of the information they provide.
	4	Can reflect on the roots and motives of decisions, action and lifestyles to compare individual benefits and costs with societal benefits and costs.
	5	Can look at various sources of evidence and assess their reliability to form opinions about sustainability.
Attitudes	1	Is curious and inquisitive about the links between the environment, human action and sustainability.
	2	Trusts science even when lacking some of the knowledge required to fully understand scientific claims.
	3	Takes an evidence-based perspective and is ready to revise it when new data emerge.
	4	Is willing to accept and discuss sustainability questions, issues and opportunities.
	5	Is sceptical about information on sustainability before verifying its source and investigating potential vested interests.

Table 7: problem framing.

Embracing complexity in sustainability		
2.3 **Problem framing**	To formulate current or potential challenges as a sustainability problem in terms of difficulty, people involved, time and geographical scope, in order to identify suitable approaches to anticipating and preventing problems, and to mitigating and adapting to already existing problems.	
KSA		*Statements*
Knowledge	1	Knows that sustainability problems are often complex and that some cannot be solved entirely.
	2	Knows that measures and action to address a sustainability problem depend on how the problem is framed (by/with/for whom, where, when, why).
	3	Knows that to identify fair and inclusive actions, it is necessary to look at sustainability problems from different stakeholder perspectives.
	4	Knows that sustainability issues range from relatively simple to complex problems and that establishing their type helps find suitable approaches.
	5	Knows that current or potential sustainability problems can quickly evolve and therefore need to be frequently redefined and reframed.
Skills	1	Can factor in perspectives of multiple stakeholders, considering all life forms and the environment to frame current and potential sustainability challenges.
	2	Can apply a flexible, systemic, life cycle and adaptive approach when framing current and potential sustainability challenges.
	3	Can establish a transdisciplinary approach to framing current and potential sustainability challenges.
	4	Can continuously explore the problematics of a sustainability issue to broaden the range of alternatives and solutions.
	5	Can identify appropriate approaches to mitigate, adapt and potentially solve sustainability problems.
Attitudes	1	Strives to tap into all sustainability competences when framing current and potential sustainability challenges.
	2	Is committed to presenting a sustainability problem as a complex one rather than oversimplifying it.
	3	Tries to detach one's own judgement from the process of framing the problem.
	4	Listens actively and shows empathy when collaborating with others to frame current and potential sustainability challenges.

Table 8: futures literacy.

Envisioning sustainable futures		
3.1 **Futures literacy**	To envision alternative sustainable futures by imagining and developing alternative scenarios and identifying the steps needed to achieve a preferred sustainable future	
KSA		*Statements*
Knowledge	1	Knows the difference between expected, preferred and alternative futures for sustainability scenarios.
	2	Knows the difference between short , medium and long term approaches and their implications for sustainability scenarios.
	3	Knows that scenario development can factor in past events and current signals of change.
	4	Knows that scenarios can inform decision making for a desired sustainable future.
	5	Knows that effects caused by humans play a major role when mapping alternative and preferred future scenarios.
Skills	1	Can envisage alternative futures for sustainability that are grounded in science, creativity and values for sustainability.
	2	Can analyse and evaluate futures and their opportunities, limitations and risks.
	3	Can identify action and initiatives that lead to a preferred future.
	4	Can anticipate future implications by looking at past trends and present conditions.
Attitudes	1	Has a long-term perspective when planning, assessing and evaluating sustainability actions.
	2	Is concerned about the impact of one's own action on the future.
	3	Is aware that the projected consequences on self and community may influence preferences for certain scenarios above others.
	4	Seeks to combine rigorous methods for thinking about the future with creative and participatory approaches.

Table 9: adaptability (**EntreComp).

Envisioning sustainable futures		
3.2 **Adaptability**	To manage transitions and challenges in complex sustainability situations and make decisions related to the future in the face of uncertainty, ambiguity and risk. **	
KSA		*Statements*
Knowledge	1	Knows that human actions may have unpredictable, uncertain and complex consequences on the environment.
	2	Knows that there is no single solution to complex socioecological problems, but rather different alternatives depending on time and context.
	3	Knows about risks associated with transformations of the natural environment by humans.
	4	Knows which aspects of personal lifestyle have higher impacts on sustainability and require adapting (e.g. air travel, car usage, meat consumption, fast fashion).
	5	Knows the importance of the link between local impacts and global sustainability.
Skills	1	Can adapt to different approaches when working on sustainability.
	2	Can identify and adapt to different lifestyles and consumption patterns to use fewer natural resources.
	3	Can take into account local circumstances when dealing with sustainability issues and opportunities.
	4	Can navigate the ambiguity and uncertainty around sustainability issues while thinking about alternatives.
Attitudes	1	Acknowledges the emotional impact of climate change, loss of biodiversity and impoverishment.
	2	Is willing to discontinue unsustainable practices and try alternative solutions.
	3	Is comfortable considering sustainable options, even if competing with personal interests.
	4	Is flexible, resourceful and adaptable in coping with unexpected environmental changes.
	5	Copes with trade-offs in decisions on sustainability within and across domains (environmental, social, economic, cultural, political) and across time and space.

Table 10: exploratory thinking.

Envisioning sustainable futures		
3.3 **Exploratory thinking**	To adopt a relational way of thinking by exploring and linking different disciplines, using creativity and experimentation with novel ideas or methods.	
KSA		*Statements*
Knowledge	1	Knows that sustainability problems must be tackled by combining different disciplines, knowledge cultures and divergent views to initiate systemic change.
	2	Knows the importance of exploring and experimenting with new avenues and ideas to tackle complex sustainability challenges.
	3	Knows the main concepts of a circular economy and society.
	4	Knows about sustainability and sustainable development concepts, including origins and further developments, main stakeholders, implications for society and the planet, environmental protection, restoration and regeneration.
Skills	1	Can use evidence and research to better understand, explain, predict and manage change for sustainability.
	2	Can combine knowledge and resources to tackle sustainability challenges.
	3	Can synthesise sustainability-related information and data from different disciplines.
	4	Can creatively apply circular economy concepts, such as valuing quality over quantity and reusing and repairing.
	5	Can accommodate divergent opinions.
Attitudes	1	Is prone to experiment and not afraid to fail when faced with sustainability challenges.
	2	Embraces thinking both inside and outside of norms in relation to sustainability.
	3	Is committed to considering sustainability challenges and opportunities from different angles.
	4	Dares to make unusual choices.

Table 11: political agency.

Acting for sustainability		
4.1 **Political agency**	To navigate the political system, identify political responsibility and accountability for unsustainable behaviour, and demand effective policies for sustainability.	
KSA		*Statements*
Knowledge	1	Knows how political systems, including their components, should work for sustainability.
	2	Knows the relevant political stakeholders for sustainability in one's own community.
	3	Knows how to engage with political and economic stakeholders to co-create sustainability policies with community representatives.
	4	Knows policies that assign responsibility for environmental damage (e.g. "polluter pays").
Skills	1	Can analyse how power structures and political systems exert influence.
	2	Can engage in democratic decision making and civic activities for sustainable development.
	3	Can identify relevant social, political and economic stakeholders in one's own community and region to address a sustainability problem.
	4	Can propose alternative pathways for sustainability.
Attitudes	1	Is committed to becoming an agent of change to achieve sustainability.
	2	Expects governments and public institutions to serve the common good.
	3	Demands political accountability for unsustainable behaviour.
	4	Is committed to questioning the effectiveness of policies for sustainability.

Table 12: collective action.

Acting for sustainability		
4.3 **Collective action**	To act for change in collaboration with others.	
KSA		*Statements*
Knowledge	1	Knows the main sustainability stakeholders in one's own community and how to contact them.
	2	Knows that working with others to promote nature and support fairness requires respect for democracy.
	3	Knows how to work with diverse participants to create inclusive visions for a more sustainable future.
	4	Knows the importance of empowering individuals and organisations to work collaboratively.
Skills	1	Can build diverse coalitions to address wicked problems related to sustainability.
	2	Can create transparent, inclusive and community-driven processes.
	3	Can create opportunities for joint action across communities, sectors and regions.
	4	Can work collectively in sustainability change processes.
	5	Can identify stakeholders' strengths.
	6	Can act in line with shared narratives on sustainable futures.
Attitudes	1	Is willing to engage with others to challenge the status quo.
	2	Is motivated to collaborate in order to shape inclusive sustainable futures.
	3	Prioritises sustainability values and interests when taking collective action.
	4	Wants to give back to the community and nature.
	5	Is committed to change for a more inclusive and fair future.

Table 13: individual initiative.

Acting for sustainability		
4.2 **Individual initiative**	To identify own potential for sustainability and to actively contribute to improving prospects for the community and the planet	
KSA		*Statements*
Knowledge	1	Knows one's own potential to bring about positive environmental change.
	2	Knows that preventive action should be taken when certain action or inaction may damage human health and all life forms (precautionary principle).
	3	Knows that individuals have a commitment towards society and the environment.
	4	Knows that maintaining the status quo and inaction are also choices.
	5	Knows that every action has an impact even if not immediate.
Skills	1	Can apply the following principles: using fewer resources, doing better with fewer resources, and reusing the same resources.
	2	Can take personal initiative and persist in achieving sustainability objectives even in contexts of uncertainty.
	3	Can act promptly, even in the face of uncertainty and unforeseen events, keeping in mind the precautionary principle.
	4	Can mobilise others to adopt more sustainable choices.
	5	Can overcome one's own resistance to change.
	6	Can identify a network of relevant stakeholders.
Attitudes	1	Cares proactively for the planet.
	2	Is willing to take action to try to solve complex sustainability problems.
	3	Advocates for individual and collective care for those in need and for the planet.
	4	Is confident about anticipating and influencing sustainable changes.
	5	Recognises that everyday action matters.

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KJ-NA-30955-EN-N

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of the European Union

doi:10.2760/13286
ISBN 978-92-76-46485-3