Transformative Climate Resilience Education for Children and Youth: From Climate Anxiety to Resilience, Creativity and Regeneration, Literature review conducted for the ERASMUS+ Project 2023-1-SE01-KA220-SCH-000158705

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Transformative Climate Resilience Education for Children and Youth: From Climate Anxiety to Resilience, Creativity, Connection and Regeneration

ERASMUS+ Project 2023-1-SE01-KA220-SCH-000158705,

A2. Literature Review

Including information from the first consultation (A3) and initial ideas for adapting GreenComp for transformative climate resilience education targeting children and youth (A4), our policy brief (deliverable A4) and the transformative climate resilience education toolbox (A6-8)

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1 Introduction

This report has been written as part of the ERASMUS+ project CLARITY. The aim of CLARITY is to enhance educators' skills for nurturing resilience and reducing climate anxiety of learners through trauma-informed and creative approaches that link inner and outer dimensions of change.

Sustainability and climate education tend to focus on environmental facts, whilst little room is given to the human dimension of climate change and fostering transformative change (Bentz & O'Brien, 2019; Wamsler et al., 2021). With climate change generally being understood as an external, technical challenge that needs fixing, inner capacities and potential needed for addressing human mental health impacts and societal challenges related to system-wide transformation are hardly considered (ibid). Consequently, children and youth increasingly experience climate anxiety, associated overwhelm and denial (Hickman et al., 2021). CLARITY aims to address this gap.

Based on the European GreenComp Sustainability Competencies Framework (Bianchi et al., 2022) and an inter- and transdisciplinary co-creation process, we will develop an adapted competency framework for transformative climate resilience education for children and youth, policy recommendations, an innovative educators' toolbox and train educators in implementation. Through online hubs we will support related knowledge exchange and shifts in underlying paradigms and approaches.

As a result of the project, children/youth educators will be better trained to provide social, emotional, and ethical education that supports transformative climate resilience across individual, collective, and system levels. This does not only involve enhancing the mental wellbeing of children and youth, and building their capacities as transformative change-agents. It also involves creating a field of change through more regenerative cultures and communities of practice needed to address climate change and other societal crises. Project partners of this ERASMUS+ project include: Lund University, One Resilient Earth, REAL School Budapest, Climate Creativity, Legacy17, and The Vision Works.

This report serves as a basis for this work. Its aim is to provide a critical overview of prominent sustainability competency frameworks and associated pedagogical approaches, in relation to CLARITY's objective of increasing transformative climate resilience, in ways that target educators, are suitable for young learners, and address the climate anxiety of children and youth. We define **transformative climate resilience** here as the ability to cope with the impacts associated with climate change and related sustainability challenges in ways that also address the root causes of these challenges. More precisely, this involves addressing both the root causes of climate change and the root causes of varying vulnerability to climate change impacts of different individuals, population groups and communities. Knowing that the climate crisis is, in fact, a reflection or symptom of an inner, human crisis, this involves developing knowledge, skills and tools to undertake profound work at the junction of inner and outer transformation for climate resilience (Wamsler et al., 2021). Integrated inner-outer transformation refers here to nourishing inner capacities and individual and collective actions to build climate resilience in ways that deliberately change the fundamental attributes of social-ecological systems, in anticipation of climate change and its impacts. This requires, in turn, a deep understanding of transformation in complex systems, including in contexts that can be particularly traumatic, and of the associated mind-sustainability nexus (which we will elaborate on in Sections 3 and 4).

In the following Section 2, we will provide further information about the background and context of our project. We then present in Section 3 the GreenComp framework, together with other sustainability competency frameworks, before we discuss their relevance for transformative climate resilience for children and youth. In Section 4, we will turn towards the pedagogical approaches and methods that exist to nourish the identified key competencies and highlight those that are crucial for increasing transformative climate resilience. Finally, we present and discuss existing toolkits (Section

5). At the end of each Section, as well as in Section 6, we provide some key principles, essential pieces and key ingredients that can provide some guidance for adapting GreenComp for transformative climate resilience education targeting children and youth (deliverable A4), an associated policy brief (deliverable A4), and developing our transformative climate resilience education toolbox, in collaboration with educators (deliverables A6-8).

All Sections are based on a review of relevant scientific studies, and a survey-based consultation with our partners and external experts (deliverable A3; see Annex 8.1). In the Annex, we also provide some key definitions that are relevant for the work of Clarity, such as transformative climate resilience, sustainability, and learning for environmental sustainability (see Annex 8.3).

2 Project background and context

2.1 Transformative climate resilience is indispensable

With reference to the latest IPCC (2022, p. 2920, glossary) “climate resilience is the capacity of interconnected social, economic and ecological systems to cope with a hazardous event, trend or disturbance associated with climate change and its multiple impacts”. It can be achieved by “social, economic and ecological systems responding or reorganizing in ways that either maintain their essential function, identity and structure”, or” in ways that change their fundamental attributes”. The latter is called transformative or transformational climate resilience. As the climate crisis intensifies, maintaining essential functions, identities and structures of existing systems could become untenable and counterproductive.

Transformative climate resilience thus requires that a group of societal actors take action to build climate resilience in ways that deliberately change the fundamental attributes of social-ecological systems in anticipation of climate change and its impacts. This deliberate action aims at addressing the root causes of vulnerability to the impact of climate change. This is because the very function, identity, and structures of social and economic systems that are in place today, and the way ecological systems are managed in many parts of the world, have both fueled the climate vulnerability of some population groups or ecosystems directly, and contributed to soaring greenhouse gas emissions.

Addressing the root causes of multiple forms of climate vulnerability, and fostering systemic change in a chaotic climate, requires however a deep understanding of how human minds work individually and collectively. It also means embodying and engaging in transformative change with our communities, including to regenerate ecosystems, in a context of ‘complex, non-linear and potentially irreversible changes associated with global environmental problems’ (Bentz & O’Brien, 2019).

This reality calls for a different approach to education (Bentz & O’Brien, 2019; J. Blake et al., 2013; O’Brien et al., 2013), and CLARITY aims to support related advancements.

2.2 Children and youth are already suffering because of climate change

Extreme weather events such as storms, floods and droughts leading to forest fires are increasing every year, and can be particularly traumatic for children and youth (Hickman et al., 2021; Sanson et al., 2019). Projections of climate trends, and news of extreme events in other parts of the world can also cause vicarious trauma (Berry et al., 2018). This calls for a better understanding and possible extension of the definition of trauma-informed education (Berger et al., 2018).

According to Vamvalis (2023), ‘mounting evidence of the significant mental health impacts of the climate crisis among youth surfaces an alarming picture demanding a radical response from educational systems. Similarly, Wu and colleagues (2020) who synthesized current research connected to youth anxiety and mental health in the context of climate change, identified a pressing ‘call to action’, arguing that the climate crisis could cause new psychological conditions and worsen existing ones. Noting that youth are at a critical juncture in their physical and mental development, they assert that increased stress at this phase of life can lead to permanent changes to brain structure and the emergence of severe mental health issues later in life. Other authors also advocate for measuring the magnitude of the effects of climate anxiety on youth mental health, identifying groups most affected and developing approaches alongside youth to mitigate mental health effects’ (Vamvalis, 2023). Vamvalis (2023) also underlines that ‘Unfortunately, recent articles have pointed to the increased levels of environmental stress and anxiety in younger and younger children, as opposed to only teens (cf. Taylor & Murray, 2020). In addition, a recent study conducted in the U.K. revealed

that more than half of child and adolescent psychiatrists in England are seeing patients distressed about the state of the environment (Vamvalis, 2023; Watts & Campbell, 2020).

2.3 Mainstream climate change education is further harming students

Research on education for sustainability has shown that formal climate change education is often insufficient and inadequate to the challenge at hand (Bentz & O'Brien (2019); Anderson, 2012; Plutzer et al., 2016; Schreiner et al., 2005). This is particularly the case when climate change is framed as an external, environmental problem that, above all, requires expertise and political power to address. Consequently, although many young people are interested in climate change, it is easy for them to conclude that global problems are outside their sphere of action and influence (Schreiner et al., 2005). Feelings of helplessness, pessimism, and despair are common, and education about global issues may even increase these negative feelings (Hicks & Bord, 2001). Scholars are thus increasingly arguing that the overemphasis on the negative impacts and dangers of climate change in climate communication and education can lead to feelings of hopelessness and inaction (E. M. Markowitz & Shariff, 2012; Moser & Dilling, 2011; Spence & Pidgeon, 2010). In this context, Ojala (2012) stresses the importance of constructive hope for student engagement with climate change. Creating space to acknowledge difficult emotions and discussing the link between individual and collective change is also seen as important (Waldron et al., 2016). In fact, locating climate change solely in the private realm of the individual consumer may even run the risk of undermining climate action whereas locating climate action in the citizenship realm can support the extension of the concept of action necessary to enable change (Waldron et al., 2016). This last point is also confirmed by a study with students in Canada who expressed frustration about their formal educational experiences that has focused on individual responses to the climate crisis and individual actions in environmental education that further increases their mental health distress (Vamvalis, 2023). Other studies confirm that climate education tends to focus on the individual (e.g. individual carbon footprint and behavior change) and emphasize the need to address this complex, wicked issue in a more systemic, action-oriented approach. As stated by (Jensen & Schnack, 1997, p. 163), "The preoccupation with action competence as an educational concept is based on skepticism about the educational paradigm in environmental education which manifests itself partly in a marked tendency to individualization and partly in a tendency to regard the educational task as a question of behavior modification".

Accordingly, reflecting on climate change education in secondary schools, Vamvalis (2023, p. 91) further highlights that "climate change is often framed as one of many complex issues rather than centered as a deeply existential reality of utmost prominence that invites a deep re-orienting of current cultural, educational, and societal aims and objectives" (cf. Aikens et al., 2018). She underscores that "environmental education and education for sustainable development have been [...] critiqued for re-inscribing paradigms of individualism and human-centrism" (see also Kopnina, 2020). Similarly, Field (2017, p. 84) also notes that "[t]he agency of children and young people to be active participants in their educational choices (beyond competing in the global economy) is absent." In other words, adults have defined the goals and the rules that have predetermined young people's futures, without adequate consideration of young people's needs and inner dimensions more broadly (cf. Bentz & O'Brien, 2019; Vamvalis, 2023).

This criticism can be tied to a broader criticism of modern formal education, which is particularly prominent among scholars working on the decolonization and transformation of higher education for sustainability. In this context, Lin et al. (2021, p. 137) argue that:

> "[…] Higher education largely aims to train talents who would work for an economic structure that centers on possessing 'resources' or achieving 'success,' as indicated by power and wealth. […] In order to achieve efficiency and effectiveness, university departments and programs form into specialization silos, making it difficult for learners to see interrelated

> concepts and gain a holistic perspective on our ecological connection with nature. Through compartmentalized, fragmented, and abstract learning, nature and other species are not seen as alive and intelligent beings who share the world with us, but are instead treated as lifeless and inconsequential. Subsequently, the interests and wellbeing of non-human species are out of sight - and then out of mind - from many of the most highly educated people."

In the same paper, Lin et al. also argue that higher education for sustainability requires a fundamental paradigm shift toward an indigenous knowledge model inclusive of indigenous people's perspectives and values. This model acknowledges the sacred value of nature, the rights of non-human species, and the power and potential of transformative learning via collaboration with Indigenous communities.

2.4 Youth are calling for a radical change in climate change education

Regarding climate anxiety, Vamvalis (2023, p. 98) shares the experience of a 20-year-old Canadian student who notes that "her school experience did not help her process feelings of not living past 35 or dealing with the moral injury of seeing large-scale suffering caused by droughts, hurricanes and wildfires. She felt schools needed to play a much more significant role in helping young people learn coping mechanisms to address their overwhelming feelings."

Other Canadian students interviewed by Vamvalis (2023) state that they needed schools to better prepare them for reality, which is not made less frightening by disconnecting them from its presence. They also communicated that they wanted well-being to be an orienting principle in formal education systems, rather than another set that causes additional pressure and stress (Vamvalis, 2023).

Based on her study, Vamvalis (2023) argues that validating feelings of distress and worry rather than minimizing concerns and anxieties is a more proactive course of action than denial, which can be more harmful. Yet, the distress of foreclosed futures is equally matched by the heavy demand for confronting root causes stemming from the past into the present (Farley, 2009). It requires adults to be with younger learners as they confront destabilizing futures and support them in their development and actions (Verlie, 2019)."

Another result of the study of Vamvalis (2023) is that the voices and perspectives of those most affected by the climate crisis need to take more prominence in education and transformative change-making work, and that climate issues must be integrated across subjects.

These outcomes echo the information shared by young adults contributing to co-design sessions led by One Resilient Earth and Climate Creativity during the co-design of learning journeys focusing on climate resilience and regeneration. In fact, all interviews with young people pointed at the fact that nurturing well-being in the climate crisis involves attention to how meaning, purpose and hope are cultivated and sustained in young people, which has also been confirmed by other studies (e.g., Crandon et al., 2022; Dupler, 2015; Kelsey, 2020; Li & Monroe, 2019; Ojala, 2016, 2017; Pihkala, 2017; Stevenson & Peterson, 2016).

Accordingly, nurturing wellbeing in the climate crisis, starting with students' wellbeing, has to be at the core of transformative resilience education, and has to be explored and assessed for different age groups – something that is currently not integrated in formal education systems. This situation warrants an exploration of conditions conducive to sustaining students' ability and capacity to act, imagine and draw on deep sources of creativity, inspiration, sustenance and wisdom in the face of despair (Gillespie, 2019; Nelson, 2008; Vamvalis, 2023).

2.5 We can learn from different approaches and experiences of transformative learning for sustainability, for nurturing resilience, creativity and regeneration

There are numerous ways to approach transformative climate resilience education, leading to multiple approaches that are more or less disruptive to the status quo and current, unsustainable systems, despite general claims of being 'transformative'. A variety of tools can also be mobilized to pursue those different approaches.

At one end of the spectrum of transformative (climate change/sustainability) education approaches, UNESCO emphasizes the importance of social-emotional and behavioral learning. They argue that "beyond cognitive knowledge [...] we need to touch people's head, heart, and hands to help them understand the causes and impacts of global warming today". They state that our approach to schools and education needs to drastically change and promote a "whole school approach" to climate change education and learning. Such approach essentially seeks to incorporate sustainability into all aspects of a school, and to involve the wider community, to create a learning environment where students and educators breathe and live sustainability on an every-day basis (cf. Lindsay, 2020).

At the other end of the spectrum of transformative (climate change/sustainability) education approaches, is the issue of decolonization. More precisely, it is about decolonizing sustainability education. The latter involves: increasing lands under indigenous control and management; improving the reach of indigenous treaty rights and tribal sovereignty; revitalizing indigenous cultural practice; critiquing colonial- capitalist concepts of sustainability and education; understanding ethnocentrism and racism in STEM [Science, Technology, Engineering, and Mathematics] fields and research methodologies; creating space for indigenous knowledge production and cultural worldview in historically Western institutions, or within new institutions of Indigenous design; validating indigenous knowledge systems; and dismantling colonial systems (Frandy, 2018). Moreover although decolonization must be led by indigenous peoples, settlers too have important roles to play in these efforts (Frandy, 2018).

This latter approach finds resonance with diverse climate justice education approaches or frameworks, including one developed by Vamvalis (2023, p. 91) that "centers on building collaborative, reparative responses that disrupt capitalist, colonial, patriarchal and supremacist logics and dynamics while promoting ethical imaginaries and actions rooted in equity, ecological regeneration and well-being within local communities for all forms of life on the planet." In this context, linking indigenous knowledge systems and approaches to scientific and environmental learning can extend deep humility within ecological webs and regenerate conceptions and epistemologies of justice, encompassing reciprocal respect, relationality and interconnection (Burman, 2017; Ives et al., 2023; McGinty & Bang, 2016; Sheridan & Longboat, 2013; Simpson, 2014). Such approaches also resonate with ecofeminist, ecocritical and eco-pedagogical approaches that challenge the illusion of independence from nature (Lupinacci et al., 2018; Vamvalis, 2023; Walsh et al., 2020).

Similarly, according to Kwauk and Casey (2022), skill-building frameworks highlighting intersectionality for climate justice need to place increased value on pedagogical approaches that focus on transgressive social and individual learning, which means approaching green skills development as a potentially uncomfortable co-constructive process that is sitting in tension and incorporates the possibility of producing new ethical ways of thinking, being, and doing (cf. Walsh et al., 2020). At the same time, according to Mumbi Maina-Okori et al. (2018), "Examining the interconnections of social, ecological, and economic issues can help to inform a critical and inclusive conceptualization of societal problems and to reveal just and sustainable solutions to these problems. Without such analyses, environment and sustainability education runs the risk of perpetuating dominant ideologies and further marginalizing and silencing diverse voices and issues."

2.6 Climate resilience education

In relation to climate resilience education specifically, the literature is limited but we identified a study on a non-formal education project led by NGOs in Barcelona that wove together community resilience to climate change and transformative learning, including through approaches defined as civic ecology and energy citizenship (Ruiz-Mallén et al., 2022). The paper explores how such hands-on transformative learning approaches contributed to young people's critical reflection, responsibility, and agency for taking individual action towards more climate-resilient cities, while highlighting the difficulty of fostering long-term community engagement towards climate-resilience. The study demonstrates how environmental education contributes to, and at the same time is enriched by, these community initiatives, thus promoting urban climate resilience. Through the study, it becomes evident that agency is a crucial commonality underlying community resilience and environmental education approaches for promoting empowerment and transformative learning, and that transformation depends not only on acquiring more knowledge and values but also on attributing conscious responsibility to students to potentially empower them (see also Aguilar, 2018; Berkes & Ross, 2013; Norris et al., 2008; Reid, 2019). In addition, the paper raises important questions about the assessment of the impacts of such learning approaches in terms of long-term climate resilience.

Importantly, both research on climate resilience education and sustainability education increasingly identify the need to address adverse emotions associated with climate change, including the validation of eco-anxiety and ecological emotions, providing safe spaces to discuss them, and, if possible, providing embodied and creative activities to more fully deliberate on them (Pihkala, 2020). Educators are also encouraged to first practice self-reflection about eco-anxiety in order to better help students develop emotional resilience (Pihkala, 2020).

At the same time, very few papers focus on addressing trauma associated with climate change among children and youth to increase resilience. Relevant identified papers essentially focus on school responses to the impacts of Hurricane Katrina in the US, including the Classroom–Community Consultation (C3), a school-based referral model to triage students who needed intensive trauma care services (Lee et al., 2017). General approaches to trauma-informed education, which are growing in North America and are less prevalent in Europe, include acknowledging the prevalence of trauma among children and youth, recognizing the impact of these experiences on all individuals, utilizing trauma-sensitive practices and policies, and avoiding practices that may retraumatize, according to the framework provided by the Substance Abuse and Mental Health Services Administration, National Center for Trauma-Informed Care in 2015. According to Thomas et al. (2019), in a review of trauma-informed care across various organizations, three core components of trauma-informed care emerged: workforce/professional development, organizational changes, and practice changes. More precisely, the content of the most frequently cited and freely available trauma-related resources for educators can be categorized as: building knowledge (i.e., understanding the nature and impact of trauma); shifting perspectives and building emotionally healthy school cultures; and self-care for educators (Pihkala, 2020).

Moving forward, it will be critical for the CLARITY project team to further explore the possible specificities of trauma-informed care for students exposed to climate-related disasters as well as to knowledge, stories and news associated with climate change, both inside and outside school, which could be traumatizing.

Finally, there are additional literature sources that help highlight the relevance of fostering resilience through **creativity and regeneration**, which are relevant for CLARITY:

Creativity

According to Bentz & O'Brien (2019) and many other sustainability scholars, the complexity of climate change requires innovative, radical, and creative approaches to education. In this context, Bruno Latour (as cited in Bentz & O'Brien 2019) suggests that climate change is a collective experiment that invites us to look beyond and work across the traditionally defined boundaries between science and art and between laboratory and gallery to address the complexities of social, political, economic and environmental contexts of climate change. This implies shifting the traditional educational approaches that are based on a sender-receiver paradigm in scientific, creative and educational processes and moving to more co-production of knowledge, integrating experience, dialogue, and reflection.

Similarly, according to Bentz & O'Brien (2019) "integrating art and transformative learning can strengthen open-ended, exploratory thinking, as artists and artistic practices commonly address the unexplored and unexpected". They argue that art can stimulate related, creative imagination, generate an openness to questioning frames of reference and values, and ultimately serve as a principal conduit for cultural renewal.

Regeneration

The regeneration of local ecosystems can be pursued through civic ecology, which is an approach in environmental education that addresses the study of the outcomes and learning situated in those "environmental stewardship practices in which community members join together to restore and manage local resources" (Tidball and Krasny 2011, as cited in Ruiz-Mallén et al., 2022, p. 1089).

The "civic ecology" project in Barcelona suggests that "social design experiments that rely on the notions of resilience, transformation, and equity can support learning environments in which participants can become designers of their own futures (Gutiérrez, 2016). In these experiments, the diversity of participants' profiles and the different tools and forms of engagement used can lead to collaborative interactions in a playful environment and foster participants' imagination and agency for thinking about the future by changing current understandings and practices" (Ruiz-Mallén et al., 2022, p. 1091).

This example highlights the multiple benefits of collective nature-based practices for various dimensions of climate-resilience building. Examples from other organizations that engage in holistic education for regeneration, such as "Funación Paisaje" in Spain, support this.

2.7 What do teachers/educators need?

In the context of CLARITY, our first consultation showed that educators are already using multiple approaches, competency frameworks and tools to foster transformative climate change education, as described in the following sections. Conversely, very few of the surveyed educators use the term "climate resilience" or "transformative climate resilience" in their work. This has been justified by some by the need of simplifying messages with children and parents through the use of the umbrella term "sustainability". This could however also imply a lack of focus on the current direct and indirect causes and impacts of climate change, associated inner and outer dimensions, and associated future risks, in the sustainability and climate education that is provided.

The first consultation also identified some of the current difficulties and gaps in terms of resources that sustainability educators are confronted with:

- One recurring difficulty is the limited time for educators to learn about sustainability and transformation, whilst there is a rather overwhelming wealth of general information and knowledge being available. Addressing this challenge requires more institutional support to engage with resources and training.

- Educators are particularly in need of relevant resources regarding:
  - Future thinking (activities to visualize the future, e.g., solarpunk, future cities visualizations)
  - Value thinking and sustainability values (finding ways to explore with children sustainability values in an engaging way and to question and reflect on their own values)
  - Disaster risk reduction
  - Tools to work with the climate anxiety of pupils in kindergartens and elementary schools
  - Tools for educators to meet students when the educators themselves feel climate anxiety or hopelessness
  - Embodiment exercises
  - Facilitating disagreements in classrooms
  - Tools for perspective and action coordination both in already established groups and for potential multi-/transdisciplinary collaborations
  - Tools that enables people with different backgrounds/worldviews/epistemological standpoints to overcome potential quarrels
  - Tools to ensure the continuous engagement of learners in the transformation of their community and/or ecosystem
  - Tools and concrete exercises/ assignments / pedagogical tools and approaches designed for enhancing certain competencies
  - Information to identify the age appropriateness of existing tools

The above findings confirm a recent study on existing educators' competency frameworks in sustainability education across Europe, in which it was stated that "competences significantly associated with transformational education such as emotions management, futures [thinking] and achieving transformation are less addressed and receive less attention in terms of the pedagogical strategies needed to promote them" (Corres et al., 2020, p. 1).

Together with the above-mentioned general lack of consideration of inner dimensions for supporting transformation, it is thus key to further explore effective pedagogical approaches to improve educators' competences related to complex learning processes involving, for instance, emotional aspects, so that pedagogical strategies can create the space for environmental values to evolve, and support transformation (Corres et al., 2020; Weston, 1992). This requires training educators in promoting spaces for sharing experiences, emotional openness and resonant understanding, and developing educators' emancipatory qualities with transformative potential (Giangrande et al., 2019; Jickling, 2017). Those competencies are, in turn, also crucial to facilitate trauma-informed education (ibid).

Finally, and in line with our survey results, a recent comprehensive survey from the European Commission on Teachers' Education for Green transition and sustainable development (Mulà & Tilbury, 2023) also highlights the lack of pedagogical resources [across Europe] to help teachers perform their practice more effectively. They state that plenty of resources and materials are available online, but direct support for schools and teachers is especially needed to critically assess and identify those age-appropriate materials that can influence sustainability education and quality learning outcomes.

To fill the identified gaps in support, multilateral organizations, NGOs and researchers have developed resources for schools and teachers. However, without active teacher professional learning, these resources, which are mostly content-rich and available in English, are unlikely to have an impact on school and higher education practices (Iyengar & Kwauk, 2021).

3 Competency frameworks

3.1 The GreenComp framework

The European Sustainability Competence Framework, in short GreenComp, was published in 2022 by the Publications Office of the European Union (Bianchi et al., 2022). Its development formed part of the policy actions set out in the European Green Deal. The European Green Deal, approved in 2020, is a set of policy actions and initiatives by the European Commission with the overarching aim of making the European Union (EU) climate neutral in 2050 (Simon, 2019). Within this context, the aim of GreenComp is to act as a catalyst to promote learning for environmental sustainability in the European Union that can be applied in any learning context.

The development of the GreenComp framework has thus been guided by political aims and processes (i.e. not by an academic process aimed at producing an academically sound framework). Its development included some consultations with experts and stakeholders working in sustainability education and lifelong learning, and the review of a few key publications in the field (Brundiers et al., 2021; Wiek et al., 2011). In addition, an online community has been created, which continuously discusses its relevance and implementation (GreenComp Community).

Accordingly, GreenComp is meant to be **a non-prescriptive reference** for developing learning schemes that aim to foster sustainability as a competence. In other words, it can be used as a reference for a range of purposes, including curricula review; design of teacher education programs; (self-) assessment/reflection, policy development, certification, assessment, monitoring and evaluation. At the same time, it is explicitly highlighted that the framework should be adapted to specific learners' needs and backgrounds, and specific contexts.

GreenComp comprises four interrelated competence areas: 1) embodying sustainability values, 2) embracing complexity in sustainability, 3) envisioning sustainable futures, and 4) acting for sustainability (Table 1). Each area comprises three competences and all areas and competences are said to be interlinked and equally important (Bianchi et al., 2022).

While learners are encouraged to develop all 12 competences, it is highlighted that learners do not need to acquire the highest level of proficiency in all 12, nor have the same proficiency across all of them. For each of the 12 competences, GreenComp specifies how it should support knowledge (K), skills (S) and attitudes (A), and concrete indicators and illustrative examples are given for each of them (see Bianchi et al., 2022).

Apart from the competency framework, GreenComp also provides a glossary that is helpful for work in the field of education for sustainability (see Annex 7.2 Table A5). It has adopted the following definition of 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" (Bianchi et al., 2022, p. 12). This definition is said to focus 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 in this context considered as **vectors for developing this competence in early childhood, through harvesting it as young children and teenagers, to putting it into context as young adults and continuously nurturing it as adults.** Sustainability as a competence thus applies to all spheres of life, both on personal and collective levels (cf. Bianchi et al., 2022).

Table 1: *The GreenComp's four interrelated competence areas (adapted from Bianchi et al., 2022).*

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.
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.

Note: The framework builds on the academic frameworks from Wiek et al. (2011) and Brundiers et al. (2021). Wiek et al. (2011) defined the following key competencies: Systems thinking; futures thinking (anticipatory); values thinking (normative); strategic thinking; interpersonal competency (collaboration) (see Fig. A1-A3 in Annex 7.2). Brundiers et al. (2021) later proposed a hierarchy, with values-thinking competency as underpinning competency (see Fig. A4 in Annex 7.2), which is reflected in GreenComp. In addition, Brundiers et al. (2021) proposed two additional key competencies, that is: intrapersonal and implementation competencies, and state that further research should clarify whether intrapersonal capacities impact key competencies in sustainability through the concept of competency or mindset and that more research is needed to theorize the implementation competency. This relates to the intersection of inner and outer sustainability and transformation and associated inner qualities/capacities that have so far not been sufficiently addressed in GreenComp.

Based on this understanding, learning for environmental sustainability is said to have the potential to be a catalyst for change among young and adult generations, through the acquisition of sustainability competences. In this context, **learning for environmental sustainability** is defined as **aiming to nurture a sustainability mindset from childhood to adulthood with the understanding that humans are part of and depend on nature.**

In this context, it is also important to highlight that GreenComp also aims **to support transformation** as it explicitly involves a change in individual and collective mindsets whilst at the same time **addressing direct impacts and immediate needs, such as climate anxiety**. The issue of "psychological distress and negative emotions that children and young people worldwide experience because of climate change" is mentioned in GreenComp, with reference to a survey of thousands of 16- to 25-year-olds by (Hickman et al., 2021; Thompson, 2021). GreenComp also refers to the **importance of health** and wellbeing in the definition of its overall purpose, which is "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."

At the same time, the human inner qualities/capacities that are needed to support wellbeing and inner-outer transformation across scales are not sufficiently systematized and addressed. In fact, following current mainstream approaches, focus is on cognitive, professional skill development (as opposed to holistic personal development), with a fix-it and fix-others approach (cf. Bentz et al., 2022; Mehlmann, 2020).

Finally, as of today the implementation of GreenComp is limited. This was also confirmed by our survey, which showed that GreenComp is so far not widely known, nor used, by neither experts nor practitioners working in the field of sustainability and related education.

3.2 Other sustainability competency frameworks

Since GreenComp and other competency frameworks for sustainability have been published, related fields have advanced, providing new knowledge that is crucial for developing educational activities for children and youth (see Corres et al., 2020; Pacis & VanWynsberghe, 2020 for an overview). These advances relate to:

1) Incremental adjustments and improvements of previous competency frameworks (including those that GreenComp was based on), which operate and have been developed within current mainstream approaches to sustainability[1], and

2) New frameworks that have been developed from emerging fields within sustainability science, education and practice that challenge current mainstream approaches, and which particularly focus on linking inner-outer transformation processes that are relevant for supporting transformative climate resilience and reducing climate anxiety.

A recent example of the former is the framework by Fischer et al., which was published in 2023. Similar to GreenComp, it builds on Wiek et al. (2011) as a reference point for proposed learning objectives that combine "knowledge, skills, and attitudes that enable successful task performance and problem solving" (Wiek et al., 2011, p. 204). On this basis, it integrates the results of more recent academic studies, including Brundiers et al. (2021), Redman & Wiek (2021), and Wiek et al. (2016). The result is a set of seven key competencies that are shown in Table 2.

With this set of seven key competencies, the authors do not intend to propose a new competency framework. Their intention is, instead, to propose a practical, simple systematization of widely used

[1] For a review of existing mainstream approaches, please see also Corres et al. (2020).

competencies that can give a basic overview and enable the development of related education, including learning objectives and activities. Compared to GreenComp, the key competencies are not listed in relation to priorities, but rather based on processes, that is: how they could be addressed step-by-step in the classroom, starting from providing an understanding of complex sustainability challenges, before moving to related capacities that are needed to address these. Accordingly, the issue of values that is included in GreenComp first, features here under competency 6.

Table 2: *Descriptions of key competencies for sustainability by King et al. (2023) in Fischer et al. (2023). They listed key competencies are mainly derived from Brundiers et al. (2021), Redman & Wiek (2021), and Wiek et al. (2011; 2015).*

Key competencies	Definitions
1. Understanding complexity and systems thinking	The ability to collectively analyze sustainability problems and complex systems across different domains (or sectors) and scales (i.e., from local to global), thereby considering systems ontologies, cause-effect structures, cascading effects, inertia, feedback loops, structuration, and other systemic features.
2. Futures thinking and visioning	The ability to collectively anticipate how sustainability problems might evolve or occur over time (scenarios), considering inertia, path dependencies, and triggering events; and the ability to collectively analyze, evaluate, and craft rich "pictures" of future visions, considering evidence-supported alternative development pathways.
3. Planning for change and strategic thinking	The ability to collectively design and implement interventions, transitions, and transformational actions, accounting for unintended consequences and cascading effects, while leveraging assets, mobilizing resources, and coordinating stakeholders to overcome systemic inertia, path dependencies, and other barriers to reach envisioned outcomes.
4. Working as a team and collaborating	The ability to initiate, facilitate, and support different types of collaborative and participatory sustainability research and problem-solving.
5. Grappling with trade-offs and what is valued	The ability to collectively map, specify, apply, reconcile, and negotiate sustainability values, principles, goals, and targets, informed by concepts of justice, fairness, responsibility, etc., in collectively assessing the (un-)sustainability of current and/or future states of social-ecological systems and collectively creating and crafting sustainability visions for these systems.
6. Positionality and knowing your role in the broader society	The ability to be aware of one's own emotions, desires, thoughts, behaviors, and personality in relation to sustainability values and actions at personal, group, and collective levels by reflecting on one's own role in the local community and (global) society, and managing one's feelings and desires in this context.
7. Navigating personal challenges and intrapersonal resilience	The ability to practice resilience-oriented self-care in planning, regulating, motivating, evaluating, and continually improving oneself within individual and collective processes to realize sustainability solutions, while monitoring and evaluating the realization process, addressing emerging challenges, and adjusting throughout the long-term, iterative process of sustainability problem-solving.

Apart from the continuous adjustments of previous sustainability competency frameworks, other frameworks have been developed over the past few years from the emergent field of inner-outer transformation for sustainability (for an overview of this field, please see Ives et al., 2023). Based on their focus on addressing root causes of sustainability crises and understanding how associated inner and outer aspects are co-created and interdependent, they are of particular relevance for supporting transformative climate resilience.

In contrast to the previous frameworks, their focus is less on professional skill development for addressing sustainability crises, which have traditionally been understood as external, technical challenges. Instead, emphasis is on identifying and nurturing innate human qualities and capacities that are needed to address today's metacrisis. The latter is understood as a reflection of an inner crisis, because it is the result of modern societies' story of disconnection (or separation), which assumes that we are all separate from each other, that some humans are superior to others, and that we are separate and superior to the rest of the natural world (Böhme, 2023; Ives et al., 2023; Scott et al. , 2021; Wamsler & Bristow, 2022). Different terms have been used by different scientific and professional groups to denominate this metacrisis: a crisis of disconnection, a crisis of separation, an

existential crisis, a meaning crisis, a crisis of imagination, or a relationship crisis–all pointing towards the need for challenging current paradigms, asking and addressing existential questions about our identity, how we relate and are connected to ourselves, others and the world, and creative ways for finding new pathways.

The new theories and models of this emergent field of knowledge do not aim to replace previous competency frameworks, but instead complement them with other considerations and capacities that are needed to address the nature and root causes of today's sustainability crises. This requires an integrated understanding of inner and outer dimensions and processes of sustainability to support transformation, as presented in the Inner-Outer Transformation Model (Fig. 1).

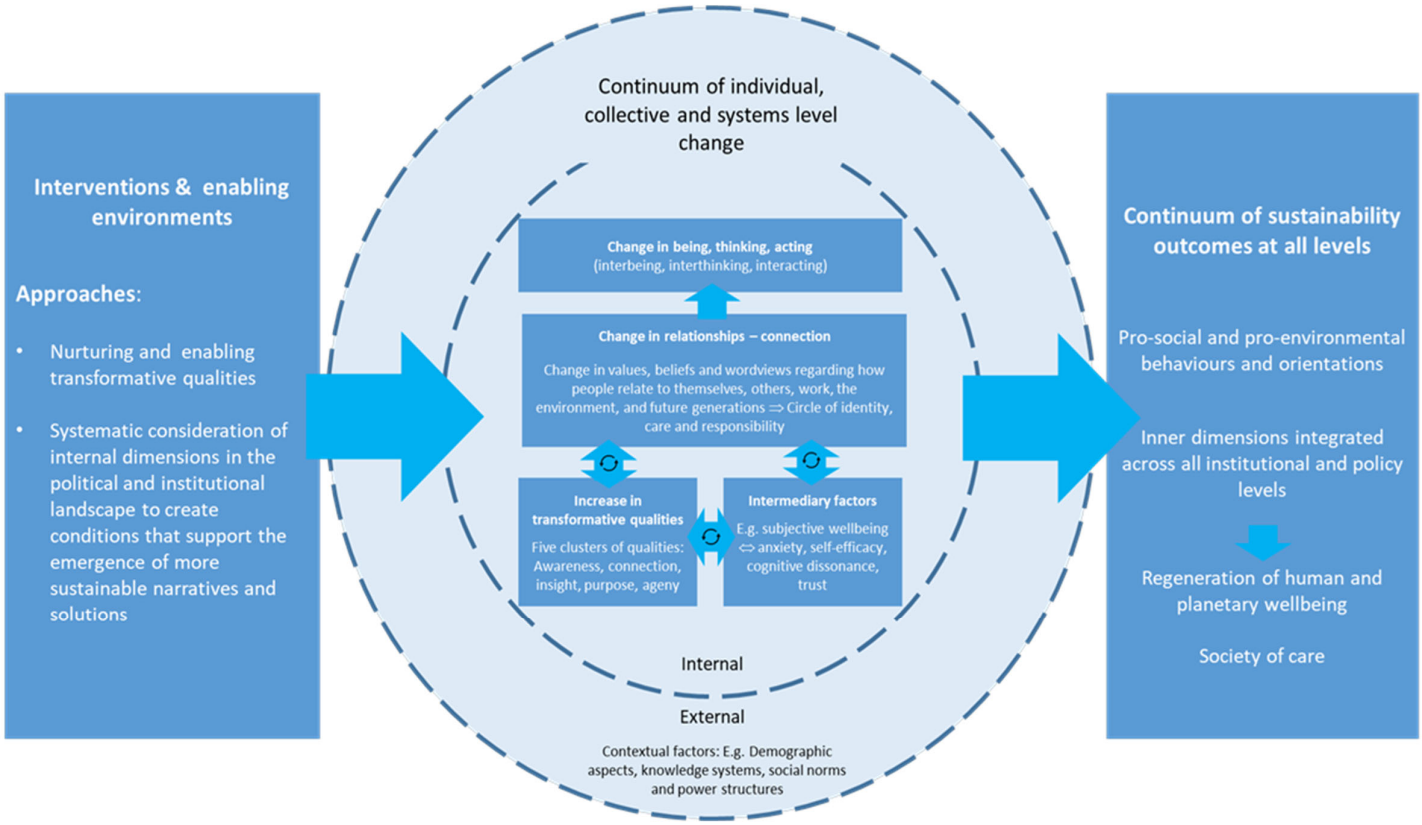


Figure 1: *Inner-Outer Transformation Model. Meta-model of Inner-Outer Transformation toward Sustainability presented in (Wamsler et al., 2021). See also Table A1 in Annex 7.2 for a simplified illustration of the framework and Figure A5 for an overview of cluster definitions and associated qualities/capacities.*

The *Inner-Outer Transformation Model* shows that **transformative qualities/capacities (and associated intermediary factors, such as wellbeing and climate anxiety) influence sustainability across individual, collective and system level because they relate to certain worldviews, beliefs and values that delineate our connections or relationships with ourselves, others, and nature** (Wamsler et al., 2021). These influence, in turn, the three dimensions of agency at individual and collective levels: interbeing, interthinking and interacting (Wamsler et al., 2021; see Fig. 1). Grey literature and conceptual mapping by other organizations support this understanding (e.g., Bockler & Hector, 2022; Global Grassroots, 2022).

The *Inner-Outer Transformation Model* also indicates that **there are three complementary ways to support change** (Wamsler et al., 2021). The aim of these approaches is to integrate/mainstream the consideration of inner dimensions of sustainability across individual, collective and system levels,

which is relevant for educational bodies that want to support transformative resilience. The three approaches include:

a) **Individual level:** Initiatives which support inner capacities and practices that can help people to tap into their potential to support change (e.g., through related education, training, coaching);
b) **Collective/group level:** Initiatives which support related learning environments (e.g., in form of transformative spaces, networks, and dialogues, exhibitions, festivals, movements, etc. to create a culture of growth and nourish fields of change);
c) **Institutional/system level:** Initiatives aimed at systematically integrating the consideration of inner dimensions into institutional systems, thus disrupting existing mechanisms and structures and creating the conditions for sustained action across all sectors and fields (including e.g., both teachers and learners) to support the emergence of a new, more sustainable narrative in educational organization, other organizations and society at large. It requires for instance the systematic revision of organizations' vision statements, communication and management tools, working structures, policies, regulations, human and financial resource allocation, learning infrastructures and collaboration (Wamsler et al., 2021; cf. Wamsler & Osberg, 2022).

There are thus three complementary approaches at a) individual, b) collective/group and c) institutional/system level that need to be addressed, together with the associated political and power landscape. This is particularly relevant to ensure that both educators and learners and their particular contexts are considered in a way that is transformative (e.g., in whole school approaches).

On the basis of systematic theoretical and empirical analyses of current knowledge and associated gaps, the *Inner-Outer Transformation Model also* defines the required transformative qualities/ capacities, which have been systematized under five clusters: awareness, insight, connection (or belonging), purpose and agency (Fig. 1). Together, these competencies can enable sustainability and transformation across individual, collective, and institutional/system levels:

- **Awareness:** The ability to meet situations, people, others and one's own thoughts and feelings with openness, presence and acceptance. This cluster is thus about our ability to be, to be aware, i.e., to be present, self-reflexive and attentive, with an open-minded and accepting attitude.
- **Insight:** The ability to see, understand and bring in more perspectives for a broader, relational understanding of oneself, others and the whole. Hence, this cluster is about our ability to gain insight, i.e., to think from a relational, equitable and systems perspective, which recognizes complexity and interconnectedness, being able to seek and hold different perspectives.
- **Connection (or belonging):** The ability and desire to see and meet oneself, others and the world with care, humility and integrity, from a place of empathy and compassion. This is about our ability to connect, i.e., to relate with a pro-social, servant attitude, embracing our common humanity and nature.
- **Purpose:** The ability to navigate oneself through the world, based on insights into what is important (intrinsic, universal values).[2] In other words, this cluster is about our ability to find and live our purpose, i.e., to commit to and collaborate based on intrinsic, universal values.
- **Agency:** The ability to see and understand broader and deeper patterns and our own role in the world in this regard, and to have the intention, optimism and courage to act on it. From a place of awareness, connection, and understanding of our interconnectedness and place in the world, we can develop a deep sense of individual and collective agency and to move into acting–with resilience, active and stubborn hope, and courage. (Wamsler et al., 2021)

[2] For more information on the link between intrinsic and universal values related to sustainability, please see Ives et al. (2023), Sharma (2017), and Wamsler & Osberg (2022).

Importantly, the clusters of awareness, insight, connection and purpose were also identified as the key clusters/competencies for wellbeing, including student health (Dahl et al., 2020; Dahl & Davidson, 2019; Furber, 2021).[3] Similar to GreenComp, the Inner-Outer Transformation Model, the associated clusters of transformative qualities/capacities and the wellbeing framework apply to all spheres of life, both on personal and collective levels (cf. Bianchi et al., 2022).

All five clusters of transformative qualities/ capacities relate to all four GreenComp's areas, but certain clusters are more directly related to some areas than others. Awareness and purpose are for instance intrinsically linked to embodying sustainability values; insight is key for embracing complexity in sustainability; connection is important for envisioning sustainable futures, and agency is crucial for acting for sustainability.

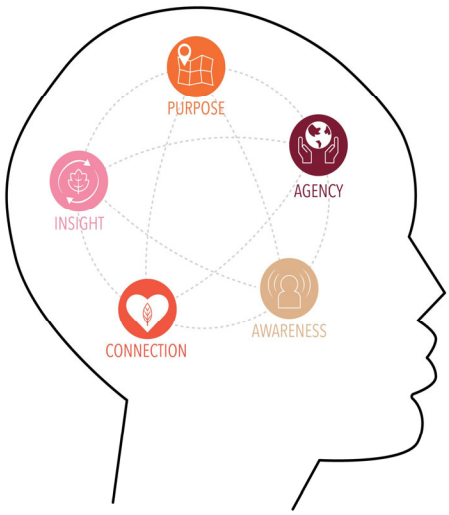


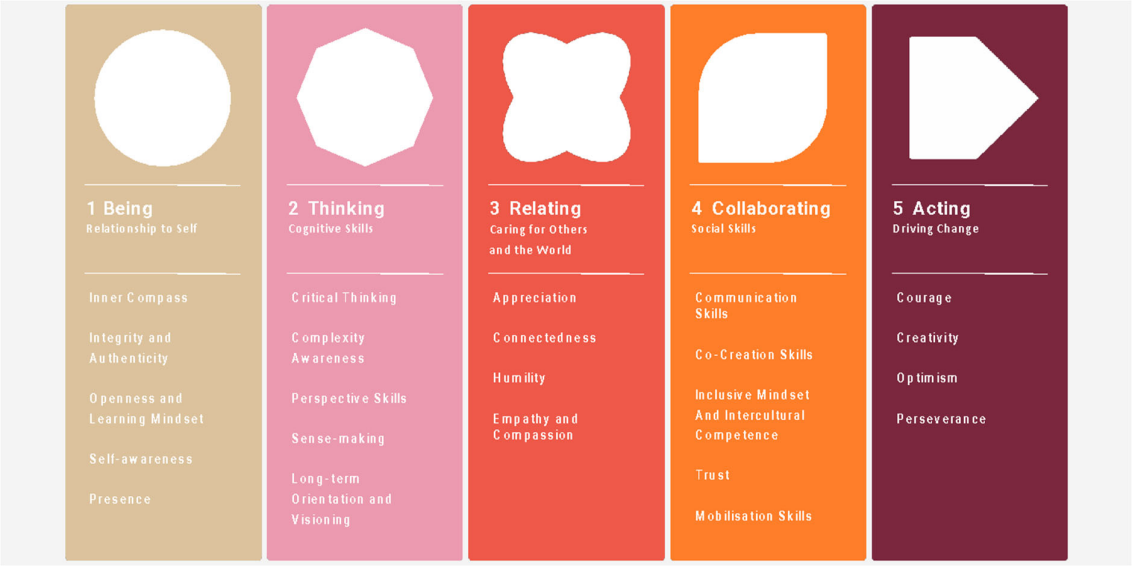
Figure 2: *Illustration of the clusters of transformative qualities/capacities that form part of the Inner-Outer Transformation Model. Note: The cluster of connection can also be titled 'belonging', as all clusters ultimately aim at expanding and strengthening relationality and connectedness (to self, others, nature). Source: Adapted from (Wamsler et al., 2021). Further note that the five clusters also relate to the five clusters of the Inner Development Goals (IDGs) framework presented below.*

The Inner Development Goals (IDGs) framework, which is aimed to advocate inner development for sustainability in communication and practice, follows the same logic by clustering the identified transformative skills under the headings of being, thinking, relating, collaborating, and acting (IDG Initiative, 2021). They are presented in Table 3 and Figure A5 in Annex 7.2.

The IDG framework is a communication tool, which has been developed through a large co-creative process that started in 2019. Today, it has already been adopted by many organizations within Europe and worldwide as a reference frame for sustainability-related work and education. These organizations include governments, universities, schools, other educational bodies, private companies and associated learners of all ages. Its strength lies in the combination of both professional and intrinsic human capacities, its co-creative open-source approach, as well as its simple, carefully designed messages and presentation (developed by the same company that designed the SDG logos, and other communication tools).

[3] Seeing wellbeing as a skill, Davidsson and colleagues also offer tools (and a related app) that support awareness, insight, connection and purpose.

Table 3: *The IDG framework and associated clusters of transformative skills, which are to some extent supported by the related, academic Inner-Outer Transformation Model.*



Due to the close involvement of scientific experts, practitioners and decision-makers during the co-creative process, most key competencies from the previously-presented scientific and policy frameworks have been included, but in simpler, accessible language (e.g., GreenComp's four areas feature for instance under: 1) being (embodying sustainability values), 2) thinking (embracing complexity in sustainability), 3&5) relating and acting (envisioning sustainable futures), and 4&5) collaborating (acting for sustainability)).

The IDG framework, together with the Inner-Outer Transformation Model and the associated clusters of transformative qualities/capacities that provide a scientific grounding and reference point for the IDGs, have recently been applied and tested in several sustainability education programs, with positive impact on sustainability outcomes across individual, collective and system levels (Ivanova & Rimanoczy, 2021; Ramstetter et al., 2023; Rupprecht & Wamsler, 2023; Wamsler et al., 2023). Some of these programs were directly linked to the EU and its Green Deal (Janss et al., 2023), whilst others had a broader focus. The program evaluations show important changes in how people relate to themselves, others and nature that support both wellbeing and transformation (e.g., programs resulted in reduced climate anxiety, an increased sense of agency and changes in current narratives). In addition, they also show increased action-taking across all three approaches for inner-outer transformation described above (Ramstetter et al., 2023; Rupprecht & Wamsler, 2023; Wamsler et al., 2023; see also Figure A6 in Annex).

Another, recent model that has influenced discussions about the types of inner qualities/capacities that are needed for supporting transformation towards sustainability is presented in Figure 3 It illustrates the so-called mind-sustainability nexus, and particularly the intersection between the mind and sustainability in today's modern societies. It shows that we can divide the intersection of mind and today's sustainability crises, such as climate change, into three categories. In fact, they show that the mind is: i) a victim of climate change impacts (e.g., climate anxiety); ii) a barrier to adequate action (e.g., due to biases); and iii) a key driver, or root cause of climate change, which relates to our story of separation described above. The net result is a vicious cycle of deteriorating individual, collective, and

planetary wellbeing. Consequently, to convert this vicious cycle into a virtuous cycle, we need to develop capacities that respond to all three aspects.

Hence, similar to the Inner-Outer Transformation Model (Fig. 1), the mind-sustainability nexus (Fig. 3) indicates that transformative resilience requires a balanced approach that includes:

- Addressing immediate wellbeing needs (e.g., anxiety), *whilst at the same time*
- Sourcing inner potential to flourish and support transformation, *to ultimately support*
- Shifting broader societal norms, systems and narratives. (Wamsler et al., 2021; Wamsler & Bristow, 2022)

Evidently, these aspects are not to be addressed alone or in isolation, but must be pursued through institutional mainstreaming and be supported by groups, movements and communities, with educational settings being particularly relevant for this work.

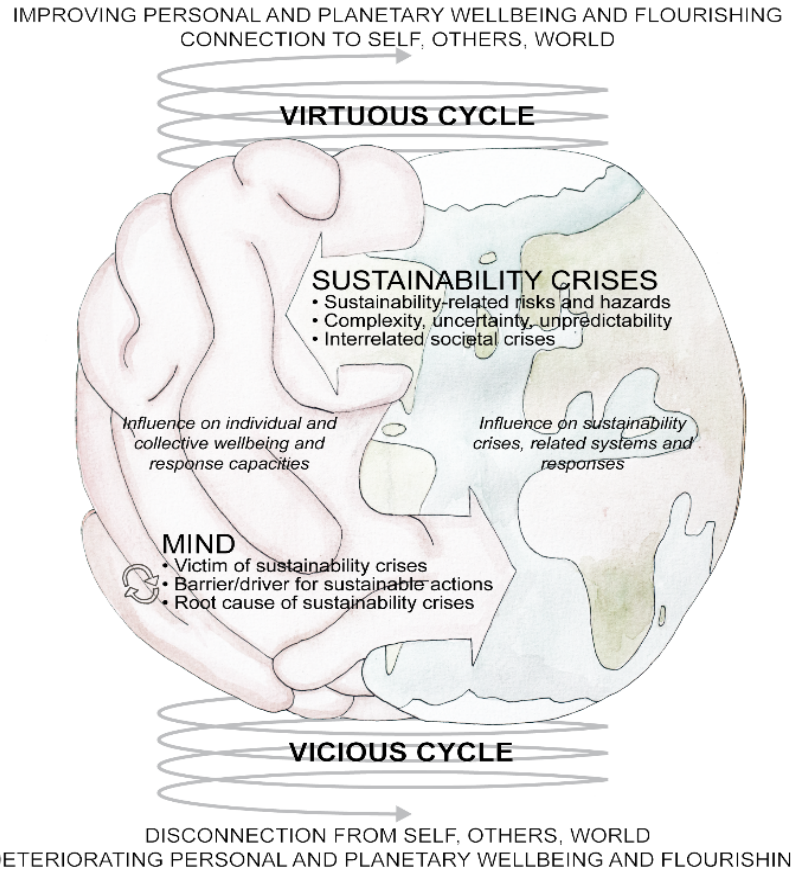


***Figure* 3:** *The intersection of mind and sustainability crises, showing the importance of moving from a vicious cycle of deteriorating wellbeing to a virtuous cycle of increasing personal, collective, and planetary flourishing. Source: Adapted from Wamsler & Bristow (2022).*

Finally, our own survey showed that apart from the above-mentioned competency frameworks, the following models or approaches are also used by CLARITY's partners and experts in the field. They include frameworks and models that are of general nature as well as frameworks that have been particularly developed for primary and higher education:

- Frameworks developed and promoted by the EU, which overlap to some extent with GreenComp but present other key areas, prioritization and clustering:
  - The EU Entrecomp Framework for entrepreneurial teaching (Bacigalupo et al., 2016).

- The European University Alliance for Global Health (EUGLOH) approach (EUGLOH, n.d.). See here.
- The EU rounder sense of purpose framework (A Rounder Sense of Purpose, n.d.). See here.

- University-specific capacity development frameworks:
  - E.g., the one used at the University of Leiden (2016). See here.
- Frameworks of non-profit organizations:
  - The One Health approach (World Health Organization, 2017). See here.
  - The Dream of the Good framework (which is particularly used in schools) (Drömmen om det goda, n.d.). See here.
- Scholarly frameworks developed by diverse researchers and practitioner:
  - A transformative Edge: Core educator competences for transformative learning by Mehlmann (2020).
  - The "Teaching for Quality Learning at University" Competencies by Biggs et al. (2022).
  - A practical guide to flourishing, focused on mindfulness and other character strengths, by Niemiec (2014).
  - The Three Spheres of Transformation framework by O'Brien & Sygna (2013).
  - The Nomadic Ethics of Rosi Braidotti (2006).
  - The New Art of Teaching and Training by (Pryor, 1999).

Overall, it can be said that there is a great overlap of the different frameworks, but depending on the specific target groups and aims (e.g., focus on addressing impacts or root causes), certain structures, aspects and capacities (e.g., professional versus intrinsic capacities) are given preference over others.

3.3 Comparison and conclusions

In summary, GreenComp is a valuable meta-level framework, with links to ongoing academic debates and studies. It builds on existing sustainability competency frameworks and acknowledges to some extent the importance of inner dimensions for transformation; that is: individual and collective mindsets (beliefs, values, worldviews and associated inner qualities/capacities).

At the same time, related frameworks and knowledge GreenComp builds on have advanced since its development. In the GreenComp, inner dimensions and associated inner-outer processes that are crucial for transformational resilience and addressing climate anxiety are still given little consideration, compared to professional skills focused on outer challenges and change. Such professional skills can largely be trained through traditional, cognitive learning approaches. In contrast, the former requires whole-person learning, dedicated curriculum spaces, embedding well-being sensitive and relational orientation in teaching, providing educators with professional development and well-being opportunities and developing inclusive multi-sectoral educational ecosystems (cf. IF20, 2023)–all aspects that are relevant for CLARITY.

Other weaknesses of Greencomp in relation to transformative climate resilience include the following:

- There is little focus on climate change adaptation, or living with the impacts of climate change, even in the section about adaptability. The latter is defined as "being flexible and able to adapt to new situations and adjust in order to accommodate changes in our complex world" (Bianchi et al., 2022, p. 24) and is related to the aspects of uncertainty about the future, trade-offs in sustainability, and managing' one's emotions.
- The section on "supporting fairness" could have a more explicit intersectional angle, in addition to highlighting interspecies and intergenerational equity. Questions of climate justice, reciprocity and repair as well as colonial continuities could be addressed here.
- The concept of "sustainability" is defined as remaining within planetary boundaries. However, in the current state of boundaries' overshoot, sustainability also requires massive work on

depollution as well as the regeneration of ecosystems. Conversely, the concept of regeneration is not given prominence, opening questions regarding the structures and systems that are suggested to be sustained.

In our first consultation, educators also highlighted that they particularly value co-design, co-creation and working with and through collective action and movements to support change. This relates both to the acquisition and to the practice of sustainability competencies. Besides, educators highlighted the importance of mobilizing frameworks and tools that are grounded in ethics and methods that trust the learners' innate capacities, including its leadership capacities, and respect their authenticity. These dimensions are however not particularly central in the GreenComp.

Whilst GreenComp can thus serve as a useful reference point for supporting transformative resilience in children and youth, in practice it has to be linked to frameworks that build on latest research and understandings of today's metacrisis (as being a reflection of an inner crisis leading to a lack of inner capacities, agency and collaboration, versus being portrayed as external, technical in nature, together with associated instrumental fix-it and fix-other approaches).

Hence, in the context of transformative climate resilience, which is the focus of CLARITY, developing knowledge, skills and tools to undertake profound work at the junction of inner and outer transformation is crucial. For educating children and youth, this requires a balanced approach for:

- Addressing immediate wellbeing needs (e.g., anxiety), *whilst at the same time*
- Helping children and youth to source inner potential to flourish and support transformation, *to ultimately support individual and collective action towards*
- Shifting broader societal patterns, norms and systems.

Within the context of these three aspects, there are certain issues that are highlighted in all presented frameworks as being crucial, including GreenComp. These are the need for educators to support:

1. **Acquiring an understanding of connectedness in a complex world (note: this aspect got later renamed to 'understanding and nurturing connectedness').** GreenComp describes today's societal crises as interconnected and explicitly mentions the need for identifying interconnections between environmental and socio-economic crises (including associated equity issues) to help us correctly frame such challenges. Importantly, understanding interconnectedness involves tracing the roots of sustainability crises through a culturally entrenched story of separation, thus seeing the links between personal, collective and system change and understanding that transformation is ultimately about changing relationship patterns (Wamsler & Bristow, 2022). Such knowledge can be empowering for young people as it can help to see that everybody matters, that collaboration and collective action is needed, and it supports a sense of agency, without further contributing to increasing feelings of overwhelm. In GreenComp, understanding connectedness and associated systems and complexity thinking are mentioned and linked to:
    - Supporting fairness (1.2)
    - Promoting nature (1.3)
    - Systems thinking (2.1)
    - Critical thinking (2.2)
    - Problem framing (2.3)
    - Exploratory thinking (3.3)
    - Individual initiative (4.3)

2. **Nurturing relational qualities/capacities** (note: this aspect was later merged with the first point above)**.** If we understand the roots of sustainability crises through a culturally entrenched story of separation (see previous aspect), we can clearly see the importance of nourishing inner qualities/capacities that can foster fundamental aspects of connection (to self/others/nature) and a renewed interest in collaboration. Related capacities must address all components/facets of the

mind-sustainability nexus presented in the previous section so that they can 1) support resilience to the impacts of climate change and other sustainability crises, 2) support wiser decision-making, 3) address the root causes of sustainability crises, and 4) thus ultimately support increasing individual, collective and planetary wellbeing. Looking at the GreenComp framework, it is clear that such capacities are relevant for all four areas and associated competencies. Accordingly, GreenComp recognizes the importance of feelings of connectedness and relational capacities to address today's sustainability challenges. These aspects are presented as the ultimate purpose of GreenComp, that is: "to promote ways to think, plan and act with empathy, responsibility, and care for our planet and for public health". In GreenComp, related capacities are mentioned and linked to:

- Valuing sustainability (1.1)
- Supporting fairness (1.2)
- Promoting nature (1.3)
- Problem framing (2.3)
- Futures literacy (3.1)
- Exploratory thinking (3.3)
- Collective action (4.2)

3. **Reviving life-affirming values and ethics** (note: this aspect got later renamed to 'embracing life-sustaining values')**.** Understanding the link between societal and individual norms, and supporting intrinsic, universal values[4] that support transformative resilience is crucial. It involves challenging current narratives and imagining new futures. Accordingly, also in GreenComp, values are presented as fundamental for sustainability education and are mentioned a total of 63 times in the document. In GreenComp, related aspects are particularly mentioned and linked to:

   - Valuing sustainability (1.1)
   - Supporting fairness (1.2)
   - Promoting nature (1.3)
   - Futures literacy (3.1)
   - Individual initiative (4.3)

4. **Addressing climate-related emotions and trauma** (note: this aspect got later renamed to 'taking care of emotions and trauma')**.** With the increase in climate anxiety in younger generations, it is key to address this aspect. It involves the ability to be aware of one's emotional state, find support and relevant resources, stay with the trouble when this is possible and find balance. In GreenComp, the importance of being aware of one's emotions, and addressing emotional impacts, such as "psychological distress and emotional illnesses", are explicitly mentioned, particularly in relation to younger generations. Whilst this aspect is, compared to the previous points, given little explicit consideration in the description of the GreenComp competencies, it does amongst other things influence the following aspects:

   - Valuing sustainability (1.1)
   - Supporting fairness (1.2)
   - Adaptability (3.2)
   - Exploratory thinking (3.3)
   - Political agency (4.1)
   - Collective action (4.2)

[4] In ethics, intrinsic value is a property of anything that is valuable on its own. Intrinsic value is in contrast to instrumental value (also known as extrinsic value) (Marsh, 1991). All major normative ethical theories identify something as being intrinsically valuable. For instance, for a virtue ethicist, eudaimonia (human flourishing, sometimes translated as "happiness") has intrinsic value, whereas things that bring you happiness (such as having a family) may be merely instrumentally valuable (Marsh, 1991). With sustainability being a normative science, universal values (such as equity) must underlie related action (Sharma, 2017).

- Individual initiative (4.3)

5. **Embodying change** (note: this aspect got later renamed to 'imagining change' and 'enacting change')**:** Changing unsustainable narratives is key for transformative resilience. This is, however, challenging, as we are all a product of our culture, and associated thinking, being and acting. It requires understanding about how inner and outer aspects are interrelated, and how they influence individual and collective agency and action-taking. In this context, GreenComp mentions explicitly the importance of creative approaches, creative thinking, and imagination and the need to tap into one's creativity to challenge current approaches and envision alternative futures that support transformation. GreenComp also explicitly emphasizes competences related to political agency, collective action and individual action, which complement competencies related to values and imagination. Related aspects are mentioned or linked to:
   - Futures literacy (3.1)
   - Adaptability (3.2)
   - Exploratory thinking (3.3)
   - Political agency (4.1)
   - Collective action (4.2)
   - Individual initiative (4.3)

The above-listed key competencies align with GreenComp, and at the same time they tap into the identified gaps and highlight and strengthen certain aspects that are key for children and young people. Furthermore, they align with the survey outcomes, with our partners and experts in the field indicating the importance of complexity/systems thinking, compassion and reflexivity regarding values, emotions and alternative imaginaries, all featuring as key for supporting transformative resilience. After further consultation with the Clarity partners, the key outcomes presented above, were further developed and co-created. The result is illustrated in Figure 4.

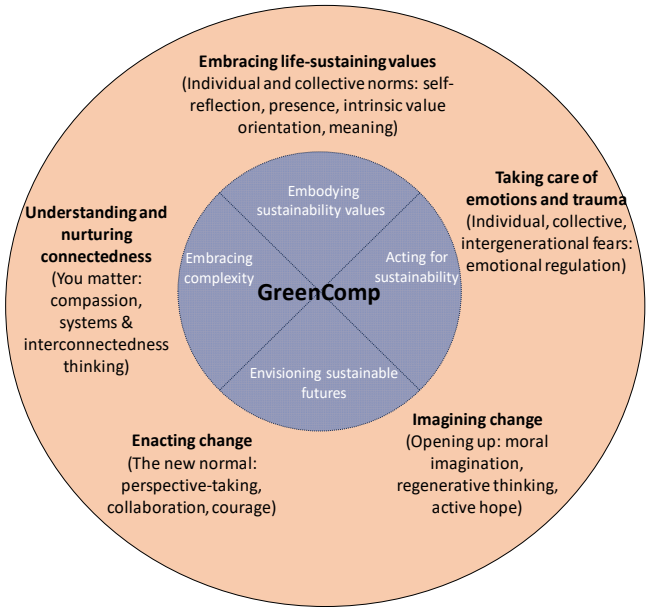


Figure 4: *Potential adaptation of GreenComp to support transformative resilience and reduce climate anxiety in children and youth, based on the literature review, our first consultation, the associated argumentation presented in Sections 2-3 and further adjustments, to improve wording and clarity. The figure indicates the required foci and key capacities within each of the competence areas.*

4 Tools

4.1 Overview of tools and exercises for nourishing key competencies

Once certain key competencies are identified (see Section 3), the key question is which pedagogies and tools to use to best support these. The question of the age-appropriateness of the tools also becomes critical. According to GreenComp, examples of pedagogical approaches that can be effective in developing sustainability competencies are numerous. Compared to traditional teaching approaches, they have in common that they are very interactive and hands-on. They include, amongst others:

- active learning (active learning is an approach to instruction that involves actively engaging students with the course material through discussions, problem solving, case studies, role plays, experimental games and simulations and other methods), including for instance
- student-centered, design-based, transformative (situated) learning contexts;
- gamification;
- 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).

GreenComp notes that the above teaching approaches can incorporate digital technologies to support people in acquiring sustainability competences. At the same time, such approaches must take into account the impact of digital technologies on mental health and sustainability, as well as potential negative impact on certain transformative qualities/capacities (such as attention and presence) (cf. Bompan & Tola, 2022; Dick, 2021; Markowitz et al., 2018; Meijers et al., 2023; Spangenberger et al., 2022; Thoma et al., 2023). In addition, GreenComp stresses **the need to factor in the context, such as the education level, the school environment, and the local community**.

The work that forms part of the emergent field of inner-outer transformation (see Section 3) suggests that **there are four broad categories of tools/exercises, which can be applied in the context of the above-mentioned pedagogical approaches, to support transformative qualities/capacities. They include: 1) contemplative tools/practices, 2) psychological and cognitive-behavioral based tools, 3) transformative facilitation and communication tools, and 4) transformational learning tools, which are all relevant for working with children and youth.**[5]

Contemplative tools/practices

This category encompasses a broad array of mind-body practices coming from a variety of scientific disciplines, professional fields and/or wisdom traditions, including indigenous people's knowledge systems and practices (Demssie et al., 2020; Druker-Ibáñez & Cáceres-Jensen, 2022). They include for instance meditation, mindfulness and compassion practices, somatics, journaling, storytelling, prayer, visualization, vision quests, contemplative dyads, deep listening exercises, and arts-based approaches. Cultivating and expanding self-reflection, awareness and consciousness is the foundation of all contemplative practices.

[5] The summary of the tools presented in this section from Wamsler, Bristow, et al. (2022), which was the result of a scientific and co-creative process with scientists and practitioners in the field.

Contemplative science, health sciences, neuroscience and other fields provide ample scientific evidence of the important benefits of such practices at an individual level, including for children and youth and in school contexts (e.g., in terms of health, well-being, and performance). In addition, there is increasing research that shows their influence on climate action and transformative change at societal levels (e.g., Blake, 2005; Hildebrandt et al., 2017; Kok & Singer, 2017; Walsh et al., 2020; Wamsler, 2019, 2020; Wamsler et al., 2022).

Recent research also indicates that certain practices can support all clusters of transformative qualities/capacities, associated worldviews, beliefs and values that are key for sustainability (Wamsler et al., 2021; see Section 3). Currently, most evidence relates to mindfulness- and compassion-based practices and tools, coming for instance from educational, healthcare, business and other professional settings (Bristow et al., 2022; Kapoor, 2007; Sajjad & Shahbaz, 2020; Thiermann & Sheate, 2020, 2021; Wamsler & Restoy, 2020).

There is also an increasing body of knowledge that shows how mindfulness and compassion can be linked and adapted to sustainability-related education, including courses focused on climate change and climate anxiety (e.g., the Mindfulness-Based Sustainability Transformations [MBST] course and the Beyond course of the Inner Green Deal and Awaris), and courses on sustainable consumption and sustainability education more broadly (Dhandra, 2019; Frank, 2021; Grabow et al., 2018; Guckian et al., 2017; Park & Dhandra, 2017; Ramstetter et al., 2023; Wamsler, 2018; Wamsler et al., 2018).

Psychological and cognitive-behavioral based tools

A range of well-established and evidence-based psychotherapeutic modalities and practices have emerged from the social, psychological and cognitive sciences that are relevant for supporting transformative resilience and sustainability education that can be mobilized in classrooms (Beck, 1964, 1995). Cognitive-behavioral therapy (CBT), which aims to challenge and change dysfunctional cognitive distortions and behaviors, is one of the best-known psychotherapeutic modalities (David et al., 2014). The Acceptance and Commitment Therapy ACT (a further development of CBT) (Biglan et al., 2020; Hayes et al., 2009, 2011), the ABC model (Ellis, 1991), the Cycle of Change (Prochaska & DiClemente, 1983) and Trauma Therapy (Briere & Scott, 2015) are additional examples of tools to facilitate individual change processes within the cognitive-behavioral approach. Cognitive-behavioral interventions are based on evidence-based principles and techniques that can support people's personal development and change processes, including those of children and youth. Evidence for their applications and impact on wider societal and systems change is still nascent, but related practices show encouraging results (Ardila Sánchez et al., 2020; Cihon et al., 2021; Clear, 2018).

Tools related to personal, adolescence and adult development theory (lifelong learning), such as the immunity to change (ITC) process (Kegan & Lahey, 2009), work by Siegel on the integrated mind (Siegel, 2022), the integral process for working on complex issues (TIP) (Ross, 2006) and related worldview approaches (Hochachka, 2019; Lynam, 2019) also fall within this category of psychological and cognitive-behavioral based interventions, and are relevant for the education of young people. Empirical work shows for instance how related approaches can support perspective-taking and deeper understanding, which in turn helps to address climate change in a more integrated way (Hochachka, 2019; Lynam, 2019).

Transformative communication and facilitation tools

This category covers transformative communication and facilitation tools that are needed to support an enabling environment for introspection, dialogue and collaboration in schools, universities and other contexts. They can strengthen transformative qualities and capacities and more integrated action-taking. Creating such enabling environments, or so-called 'transformative spaces', involves the consideration of their physical settings, non-hierarchical communication setups, and different facilitation practices (such as non-violent communication, deep listening, circles and councils), which can be used in combination with, for instance, contemplative practices (Fraude et al., 2021; Mar et al., 2021; Wamsler et al., 2020). Research suggests that transformative spaces can be powerful ways to support the creation of new cultures and new ways of collaboration.

Transformative learning tools

Over the past years, some scholars and practitioners have combined and adapted diverse tools to the context of sustainability to develop transformative education and leadership approaches. They combine complexity, systems and/or design thinking with various tools and exercises. They come with a certain theory and pedagogy, together with associated processes for linking inner and outer transformation.

Transformative education is offered by different Universities, for-profit and non-profit organizations. One example is "the Work That Reconnects" that is aimed at helping people discover and experience their innate connections with each other and transform despair and overwhelm into inspired, collaborative action (Macy & Brown, 2014). Other examples of courses are the "Online Transformative Learning" course by Legacy17, the "UN Action Learning Lab–Transforming Systems in the Decade of Action"; the "Sustainability and Inner Transformation" and "Psychology and Climate Change" courses at Lund University; "Transformative Climate Advocacy" by Pacific Integral; "Ecojustice" by Courage of Care; "Transformational Leadership" by RTLWorks and Cchange; "Beyond" and "MBST" by The Inner Green Deal and Awaris; and "The Sustainability Mindset Action Lab" supported by PRME (Mehlmann, 2020; Ramstetter et al., 2023; Rimanoczy & Llamazares, 2021; Scharmer & Senge, 2016; Sharma, 2017; Walsh et al., 2020; Wamsler, 2019). Several of these courses are targeted at young people, but not children (see also Sections 3 and 5 regarding the outcomes of some courses). In addition, One Resilient Earth has been pioneering transformative and interactive online courses on climate resilience and regeneration, following a learning ark designed to foster unlearning and emergence, and weaving together arts, indigenous peoples' knowledge, regeneration practice and science, as well as hands-on exercises.

Other transformative education courses led by collectives, including indigenous knowledge holders and Black, Indigenous and People of Colour (BIPOC), involve the course "Facing Human Wrongs" by the Gesturing Towards Decolonial Futures Collective, Andreotti and de Sousa's Through Other Eyes, "We Will Dance With Mountains", an online course festival led by the Nigerian poet and intellectual Bayo Akomolafé.

Regarding the integration of indigenous peoples' knowledge and practices, if it is done following the leadership of indigenous people, as well as principles of free, prior and informed consent, Demssie et al. (2020) state that "integrating modern education and indigenous knowledge, or traditional ecological knowledge, can provide a more rounded preparation for students in forestry, natural resources, and other professional areas'' as well as "the opportunity to study and gain experience in diversity learning and understanding of other perspectives". This requires "involving local people with

indigenous knowledge as guest lecturers in sustainability learning, as well as to giving them access to the core function of higher education i''., teaching and research" (Demssie et al., 2020).

Combination of tools

Nature- and art-based approaches exist across all four categories and are receiving increasing interest in the context of sustainability. They focus on immersion in natural surroundings to support, amongst other things, creativity and human-nature connection. Examples include nature-based mindfulness (Djernis et al., 2019), activities to enhance nature experience such as nature quests, painting, bird-watching and unstructured play in nature (Richardson et al., 2020), outdoor learning (Prince, 2017), forest bathing (Hansen et al., 2017), and green-social prescribing schemes (NHS England, 2022). A large body of evidence links the increased sense of nature-connectedness that such approaches provide with pro-environmental attitudes and behavior, such as sustainable purchasing of food (Arnocky et al., 2007; Bentz & O'Brien, 2019; Hurst et al., 2013; Martin et al., 2020; Richardson et al., 2020; Rosa et al., 2018; Udall et al., 2021).

The results of our survey also align with the results presented in this section. In fact, all tools that were mentioned by our partners and experts in the field fall within the four presented categories or types of tools. In addition, the tools that were mentioned by our partners and experts in the field are relevant for the identified key competencies presented in Section 3, and include the following:

1. **Tools for supporting understanding of connectedness in a complex world** (note: this aspect got later renamed to 'understanding and nurturing connectedness')
    - Complexity-oriented learning approach (CLA)
    - Project-based learning and whole school approach for understanding connectedness. See for instance here.
    - Sustainability compass as a systems thinking tool. See here.
    - Visioning exercises with the help of frameworks for structuring complex sustainability problems (e.g., causal loop diagrams, DPSIR [drivers, pressures, state, impact, and response model of intervention], the social-ecological systems [SESs] framework, the multilevel selection framework for sustainability analysis, Design Thinking, etc.)

2. **Tools for nurturing relational capacities** (note: this aspect was later merged with the first point above)
    - Compassion practices (related to self, others, nature)
    - Loving-kindness exercises
    - Meditation and other contemplative practices, including:
        - Deep and active listening exercises
        - Engaging with diverse knowledge holders to better understand their knowledge systems and practices (e.g. indigenous knowledge holders)

3. **Tools for reviving life-affirming values and ethics** (note: this aspect got later renamed to 'embracing life-sustaining values')
    - Core values exercises, e.g., identification of core values with the help of the value tree exercise, or based on the identification of one's own values and/or worldviews through related online tools
    - Futures Literacy Laboratory (reframe exercise and asking new questions)

- Rituals, especially those connected to nature (e.g. applied in forest schools). See related information here (page 8)
- Reflective and perspective-taking practices, linked to values, such as:
  - Journaling; a learning journal, with regular prompts for reflection and introspection
  - Deep and active listening exercises
  - Collaborating with diverse knowledge holders to better understand their knowledge systems and practices
  - "Bubbel hopping" exercises for increasing perspective-taking
  - Reflective assignments after group works and/or when reading diverse texts

4. **Tools for addressing climate-related emotions and trauma** (note: this aspect got later renamed to 'taking care of emotions and trauma')

   - Provision of safe spaces through different methods (rules, etc.)
   - Support of psychologists or care practitioners to support emotional wellbeing
   - Climate Circles: open-sharing and deep-listening circles dedicated to climate emotions
   - Supporting both young people and teachers in dealing with their own and supporting others difficult climate/eco-related emotions, through different methods presented in, for instance metodbanken.terrapi.se (for more information see Annex Table A4)
   - Learning for change; i.e. learning for ways of coping with and giving direction to change. See here.
   - Animal-assisted interventions to increase emotional well-being and reduce anxiety

5. **Tools for embodying change** (note: this aspect got later renamed to 'imagining change' and 'enacting change')

   - Futures Literacy laboratories (including ideas like solarpunk and future cities; see here and here)
   - Visualization through guided meditations and embodiment work
   - Moral activism, by P. Tickell. See here
   - Storytelling workshops (Bentz 2023; see also here)
   - Storytelling for reflecting about own values (see also above)
   - Inspired Envisioning, for ways of creating actionable images of desired futures. See here
   - Exercises to support sensuous connection to our surrounding (i.e., aesthetic connection) (Cornell, 2015)
   - Art workshops. E.g., beach cleaning combined with art workshops where the learners first clean a beach (or other area) and then use the plastic found to make an art installation in collaboration with an established artist
   - Tools that can support cooperation, such as non-violent communication

In accordance with the literature review, several survey participants also indicate that the key for supporting transformative resilience is not the individual tools and exercises, but the way they are combined. Mentioned combinations include: "Collective intelligence processes through curated group exercises including group work to solve specific problems, artistic explorations/creative exercises (e.g. performing emotions, drawing emotions, writing poetry, journalling), meditative time in nature (e.g. sit spot practice), role plays to explore time, space, and different species' perspectives". Another example was the "combination of knowledge forms: historical and contemporary conceptualizations of our relation to nature and the planet combined with experiential, embodied, i.e., sensuous, aesthetic, knowledge forms, and with reflective practices."

4.2 Comparison and conclusions

Findings from the research literature and survey outcomes suggest that relevant, potential "tools" include basic exercises (e.g. for deep listening) and more complex methods (e.g. future literacy laboratories), which consist of a sequence of different exercises. In addition, they show that supporting transformative resilience lies in the combination of tools, the diversity of tools offered, and how they are combined and adapted to specific contexts and participants' age, interests and needs (cf. Ivanova & Rimanoczy, 2021; Wamsler et al., 2021, 2022). Similar to muscle training, different practices result for instance in different mental outcomes and effects at individual, collective and system levels (cf. Böckler et al., 2018; Singer & Engert, 2019).

In the context of transformative climate resilience, tools must be offered that provide a balanced approach for:

- Addressing immediate wellbeing needs of teachers and learners (e.g., anxiety), *whilst at the same time*
- Helping learners source inner potential to flourish and support transformation, *to ultimately support individual and collective action towards*
- Shifting broader societal patterns, norms and systems (cf. Section 3).

In addition, during our first consultation, teachers underlined the importance of tools that are relevant for the identified key competencies presented in Section 3, that the tools need to be easy to use and adapt to different age groups, and they should also be student-centered, contributing to a more equal relationship between the teacher and the student.

On this basis, the following questions have to be considered when selecting the specific approaches and tools:

- Does the combination of tools support a safe space that allows for deep reflections?
- Does the combination of tools support wellbeing and reduce anxiety? Is it trauma-informed?
- Does the combination of tools support increased awareness regarding one's own fears, values, capacities, and how they are related to societal, collective fears, values and capacities?
- Does the combination of tools support transformative qualities/capacities?
- Does the combination of tools support understanding and engagement across individual, collective and system levels?

In addition, depending on the type of competence or transformative quality/capacity that is in focus, different tools and aspects might be given particular attention. Whilst socio-cognitive learning might for instance be mostly relevant for supporting an understanding of interconnection, nurturing relational capacities requires also embodied and nature-based learning, exploring values requires place-sensitive and ethical learning, working with emotions must involve trauma-informed learning, and challenging narratives requires creative learning, each in combination with other tools (Fig. 5). In other words, the identified types of learning could (and should as much as possible) be mobilized for each of the identified key qualities/capacities (e.g. understanding interconnection) in order to reach different learners and foster an understanding or a grasping of the issues that is not only intellectual. The different types of learning and associated tools bring different benefits in acquiring the 5 key qualities/capacities. Whilst thus certain approaches require particular attention for some of these, they have to be applied and combined in relation to all. For example, trauma-informed approaches should be part of all tools, not just for the climate emotions. It ensures that we do not do more harm when talking about interconnectedness, envisioning futures or developing relational capacities.

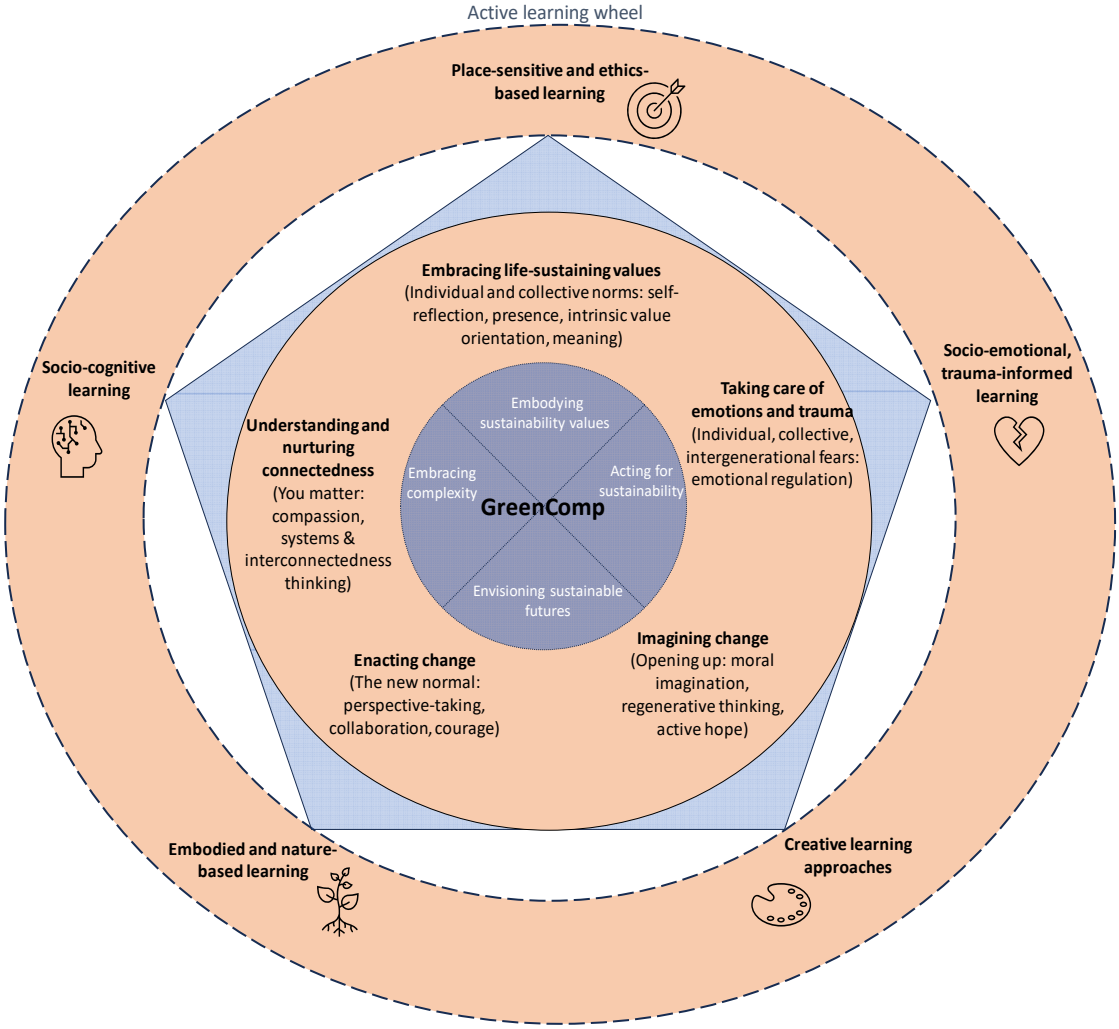


Figure 5: *Potential adaptation of GreenComp to support transformative resilience and reduce climate anxiety in children and youth, based on the literature review, our first consultation, associated argumentation presented in Sections 2-4 and further adjustments after consultations with partners, to improve wording and clarity. Importantly, all mentioned learning approaches are understood as transversal, as indicated by the learning wheel. Note: This is a simple illustration of some of our key outcomes; and the specific content, wording and design will be further developed and co-created in the context of our next Clarity activities/deliverables.*

5 Toolkits

5.1 Overview of existing toolkits

There is an increasing number of toolkits or toolboxes that provide an overview of different tools, how they can be adapted, combined and applied to the context of resilience and transformation, and/or how related outcomes can be monitored or evaluated. The listed examples below either explicitly mention that they are relevant for youth and/or children or include some basic tools that can be applied for this target group:

- UNFPA's Step up pocket guide to social change for young leaders. United Nations Population Fund (2021). See here. (Note: explicitly relevant for both children and youth)
- "Transformational Hosts International – Toolbox" (2022). See here. (Note: includes basic methods, such as active listening that are relevant for children and youth)
- "A Transformative Edge – Knowledge, Inspiration and Experiences for Educators of Adults". See here and the related "Transformational Hosts International – Toolbox" here (Note: also includes basic methods that are relevant for youth, not only adults, together with detailed instructions for the educator/facilitator)
- "The Inner Pathways Guide for Facilitators". See here. (Note: relevant for youth, explicit tool for education for sustainability)
- Compassionate systems awareness and leadership approaches by Peter Senge and others. See here. (Note: explicitly relevant for youths, targeted courses for youths exist)
- Mindfulness- and compassion-based approaches. See here. (Note: relevant for children and youth)
- Toolkit related to sustainable consumption for children and youth. See here. (Note: explicitly relevant for youths)
- Joanna Macy & Molly Brown: Coming Back to Life and other tools related to The Work That Reconnects. See here. (Note: diverse activities are used in school and university settings, such as different councils)
- Tools/toolkits from the U:lab (Theory U). See here and related reflections here. (Note: related courses are offered for youths)
- For methods that are applied in the context of the 'Sustainability and Inner Transformation' course, see here under Publications, and particularly Walsh et al. (2020), Wamsler (2019, 2020), and Wamsler et al. (2022) (Note: the focus group are youths, includes some basic methods that are also relevant for children)
- Rimanoczy, I., & Klingenberg, B. (2021). The sustainability mindset indicator: A personal development tool. See here and here. (Note: related courses are offered for youths).
- The IDG field kit and the associated research report (IDG Initiative, 2022). See here. (Note: relevant and applied for children and youth)
- Other IDG-based toolkits, developed by different hubs worldwide, such as the Transition Makers Ready-made tools. See here. (Note: developed for young learners, with detailed learning objectives, instructions, etc.)
- Tools/toolkits used within education offered by the Inner Green Deal (IGD) (Janss et al., 2023; Ramstetter et al., 2023; Wamsler et al., 2023).
- Three-step-pedagogy of the Conscious Full Spectrum Response Framework for Radical Transformational Leadership. See here. (Note: Relevant for youth; a related course targeting youth is offered; includes some basic methods that are also relevant for children) (Wamsler & Osberg, 2022).

Additional toolkits that were mentioned as relevant by our partners and experts in the field, who participated in the survey were:

- Primary and secondary school resources collection. See here.
- Moral imagination tools collection. See here.
- The EU 'A Rounder Sense of Purpose' toolkit. See here.
- Tools presented in the "Creative Approaches to Climate and Peace Education" book by Bentz (Bentz, 2023). See here.
- Re-Imaginary toolbox. See here.
- The Education for Sustainable Development (ESD) Dialogues) (Mehlmann & Pometun, 2013), which includes practical approaches to education for sustainable development by and for educators. See here.
- Gesturing Towards Decolonial Futures Depth Education toolbox. See here.
- "Feasy Training" facilitation manual for supporting youth' empowerment and sustainability. See here.

Many toolkits come with their own competency framework, that is: a set of defined key competencies, which often presents an adapted and simplified version of some existing frameworks. However, the implementation of only a few toolkits has so far been evaluated scientifically. Some exceptions are, amongst others, the IDG and IGD toolkits, together with the inner-outer transformation model and the associated clusters that provide their scientific grounding and reference point, and which have recently been applied and tested in several education programs. Related outcomes included reduced climate anxiety, changes in values and narratives, an increased sense of agency, and increased action-taking across individual, collective and system levels (Ramstetter et al., 2023; Rupprecht & Wamsler, 2023; Wamsler et al., 2023; see also Fig. A6 in Annex).

The investigation of the implementation of these toolkits also led to the identification of four essential principles, pieces or key ingredients that need to be considered when applying different tools or toolkits in classrooms, to support transformation through educational programs (Wamsler et al., 2024; see Fig. 6). They involve:

- **Context and understanding: how we see the world–**Educational activities/programs need to provide a comprehensive understanding of the nature of today's sustainability crises in a complex, constantly changing world, and one's role in it;
- **Learning approach: how we get to know–**Educational activities/programs need to offer safe spaces and integrative methods for exploring related inner dimensions and nurturing transformative capacities on a continuous basis;
- **Practical guidance and solutions: how we engage–**Educational activities/programs need to provide practical guidance on how to design and implement measures that link individual, culture and systems change and/or create conditions for related solutions to emerge; and
- **Quality control: how we ensure quality and ethics considerations across all aspects –**Educational activities/programs need to ensure quality education through the explicit consideration of ethics, the role of facilitators, and adequate monitoring and evaluation. (Wamsler et al., 2024)

Together, these four essential pieces, or key ingredients, support individual, collective and planetary flourishing, by covering all key aspects of inner-outer transformation (ontology, epistemology, praxis, ethics; cf. Ives at al. 2023). They have to be considered in the context of all tools, or sets of tools that are developed and/or selected. For more information on the listed aspects, please see Wamsler et al., (2024, Section 4).

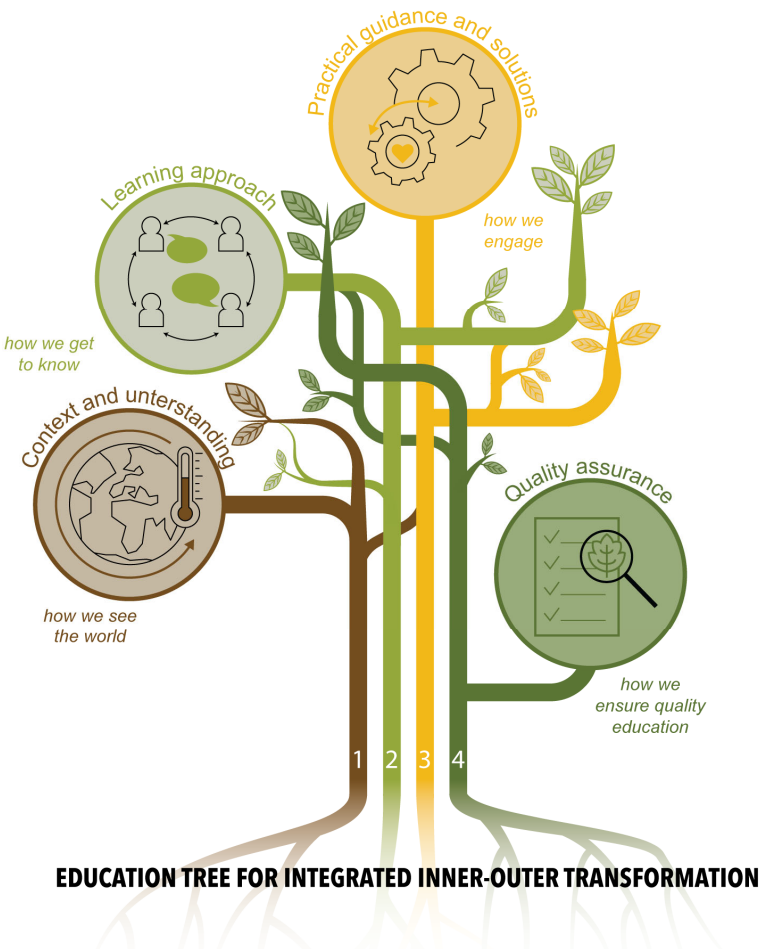


Figure 6: *The education tree by Wamsler et al. (2024) indicates the four essential pieces or key ingredients for holistic learning and understanding to accelerate sustainability transformation. They involve: 1) how we see the world, 2) how we get to know, 3) how we engage, and 4) how we ensure quality and ethical considerations across all aspects. Together, they support flourishing across scales – by covering all key contributions of inner-outer transformation.*

From the first consultation, it also appears that most of the surveyed educators are used to using a variety of toolkits in order to meet specific needs, build complementarity, and ensure alignment between their approach and the tools used. Our toolbox is thus likely to come in addition to others unless it is particularly comprehensive and user-friendly.

5.2 Comparison and conclusions

Looking at the existing toolkits and associated principles for supporting transformation, there are several aspects that are relevant to consider for developing our Clarity toolkit. These are, amongst other things:

- Access and availability: The access and availability of the toolkit must be simple and guaranteed, also after project-end.
- Design: The design should be appealing for both educators and students.

- Context and understanding: The description of the underlying framework should be presented in a simple, accessible way. It is important to clarify how the underlying framework relates to GreenComp as well as other existing frameworks to ensure the applicability of the toolkit in different institutional settings.
- Systematization of tools: Each tool and associated exercises should be clearly linked to the identified key competencies, qualities/capacities and learning approaches. If possible, it should be easy to search for specific tools based on these and other aspects (e.g. length, age).
- Age groups: The suitability of the tools for different age groups requires special attention.
- Teacher support: While designing the tools, it will be crucial to discuss and understand how to ensure that the teachers have the capacity-building support they need to use the toolkit. The training sessions need to be designed in a way that they can best meet the needs of the teachers.
- Apart from the specific tools, overarching principles should be provided to ensure quality education and comprehensive inner-outer transformation (see e.g. education tree presented above).

Based on our review and consultation, the following guiding questions can help to select the best option(s) and combinations of tools:

- Does the combination of tools in the toolkit and its design support a comprehensive understanding of today's sustainability crises, in a complex, constantly changing world, and young people's specific context in it?
- Does the combination of tools in the toolkit provide integrative methods and support the creation of a safe space for exploring inner dimensions of climate change and nurturing transformative capacities on a continuous basis?
- Does the combination of tools in the toolkit and its design support guidance based on how children and young people can develop a sense of agency and empowerment, without putting any additional burden on them?
- Does the combination of tools foster youth co-design and expressions of authenticity among learners?
- How does the combination of tools offer space and methods of exploring disagreements, difficult conversations, tensions and discomfort, whilst supporting the emergence of solutions and agency?
- Does the combination of tools in the toolkit and its design support children and youth's understanding on how small actions can influence and cut across individual, culture and system levels?
- Are the offered tools and exercises explained in sufficient detail, and with sufficient flexibility regarding personal differences and context?
- How easy is the access and application of the toolkit?

6 Conclusions

In Europe, environmental and climate education tends to focus on providing complex facts and information, without adequate consideration of people's inner lives–our emotions and feelings, and our innate capacities to address today's polycrisis. This situation is boosting rising levels of stress and anxiety in children, youths and teachers, with devastating societal and economic impacts. A radical shift in current education is urgently needed to support individual, collective and planetary wellbeing.

Climate change is impacting children and youth

Young children and teens are increasingly stressed about today's polycrisis with its inherent complexity and uncertainty. There is mounting evidence of the significant mental health impacts of climate change and associated societal crises among children and youth. They deepen existing psychological conditions at a critical juncture in their physical and mental development. Increased anxiety and stress during this phase of life can lead to permanent changes to brain structure and the emergence of severe mental health issues.

Education about environmental and climate change-related issues may even increase these negative feelings. In fact, scholars are increasingly arguing that the overemphasis on the negative impacts and dangers of climate change in education and communication can lead to feelings of hopelessness and inaction. This also affects the wellbeing of educators, which in turn affects their teaching capacities.

This situation brings out an alarming picture, demanding a radical response from educational systems.

Teachers need more support to address stress and anxiety

Teachers in Europe are committed to giving children and young people the best possible chance of a better future. But a common complaint is the level of stress linked to the role. To this adds the emotional burden of educators who teach environmental and climate change-related subjects. There is thus an urgent need for policy makers to consider ways to improve support systems for teachers that focus on helping them dealing with their own and their students' increasing stress and anxiety levels.

To support sustainability and wellbeing, new ways to support teachers and, through them, their learners are urgently needed, and are being developed within the Clarity project.

Transformative education is indispensable

Scholars and practitioners are increasingly emphasizing the importance of social-emotional and behavioral learning. Beyond cognitive knowledge, we need to address and touch people's head, heart, and hands to understand the causes and impacts of climate change and how to address them. Hence, our current approach to schools and education needs to drastically change. Policy-makers must promote more transformative environmental and climate education, which in turn requires new pedagogies for nurturing learners' innate, transformative capacities.

In order to face climate change and other complex crises faced by humanity in the 21st century, education must nurture the wellbeing of children and young people, enabling them to develop inner qualities and capacities that foster climate resilience and transformation.

Our literature review and survey have shown that such approach requires:

- Enriching curricula by integrating elements and contents aimed at cultivating transformative climate resilience competencies through i) understanding and nurturing (inter)connectedness, ii)

embracing life-sustaining values, iii) taking care of emotions and trauma, and iv) imagining and enacting change (see Fig. 8).

This involves, in turn:

- Embedding active teaching and learning that combine socio-cognitive, socio-emotional, trauma-informed, embodied, nature-based, creative, place-sensitive and ethical approaches (Fig. 7), for
- Sourcing certain key capacities, such as (inter)connectedness and systems thinking, compassion, self-reflection, presence, intrinsic value orientation (inner compass), emotional regulation, imagination, perspective-taking, a sense of individual and collective agency, active hope, collaboration and courage (Fig. 7), and
- Ensuring quality education through key principles that guide their implementation (cf. Section 5, Fig. 6)

Potential adaptation of GreenComp to support transformative resilience and reduce climate anxiety in children and youth

As described in this review, the European Sustainability Competence Framework (GreenComp), published in 2022, provides a general framework for educators to understand what sustainability as a competence entails. For its application, it must be adapted to the particular context and learners' needs. In the context of Clarity, focus is here on addressing climate anxiety and stress in children, youth, and their teachers in transformative ways.

GreenComp responds to the growing need for people and societies to improve and develop the knowledge and capacities to live, work and act in a sustainable manner. It highlights four interrelated competence areas to help learners become critical thinkers, and develop agency and capacities for supporting individual, collective and planetary wellbeing. These competence areas are: 1) embracing complexity in sustainability, 2) embodying sustainability values, 3) envisioning sustainable futures, and 4) acting for sustainability. In the context of Clarity, this requires educators to find ways to nurture certain key competencies and capacities in these four areas (Fig. 7), in order to link individual, collective and planetary wellbeing and regeneration. These are, amongst others: (inter)connectedness and systems thinking, compassion, self-reflection, presence, intrinsic value orientation (inner compass), emotional regulation, imagination, perspective-taking, active hope, collaboration and courage (Fig. 7).

Sourcing such capacities is in contrast to today's core curriculum that tends to focus on students having the capacity to make responsible choices, leading to climate change action being individualised and consumer oriented. The collective and deeper aspects are lost, making students demotivated and feeling like they don't matter. Providing a comprehensive understanding of how individual, collective and planetary wellbeing are interdependent and connected is thus crucial, whilst at the same time helping students exploring difficult emotions and nurturing transformative capacities, such as presence, compassion, agency, imagination, hope and courage to act.

As shown in our literature review, nurturing the identified capacities requires new pedagogies that link cognitive, socio-emotional and behavioral learning with ethical, place-sensitive, trauma-informed and creative approaches. Through these pedagogies, Clarity aims to develop learning journeys that can step-by-step build up:

- Resilience to thrive in unstable, volatile and chaotic environments,
- Creativity to envision different worlds without triggering our desire for comfort and safety in the habitual;

- Connection to ourselves, others and our ecosystems, allowing to explore whole heartedly different worldviews; and ultimately
- Regeneration (in all areas of lives) can come in as a way to make the human experience more joyful and nourishing, no matter the outcomes.

Together, the described elements form the basis of Clarity's framework for children and youth, which will be further developed and co-created during the following weeks and months, and tested in form of an innovative educators' toolbox and associated educators' training.

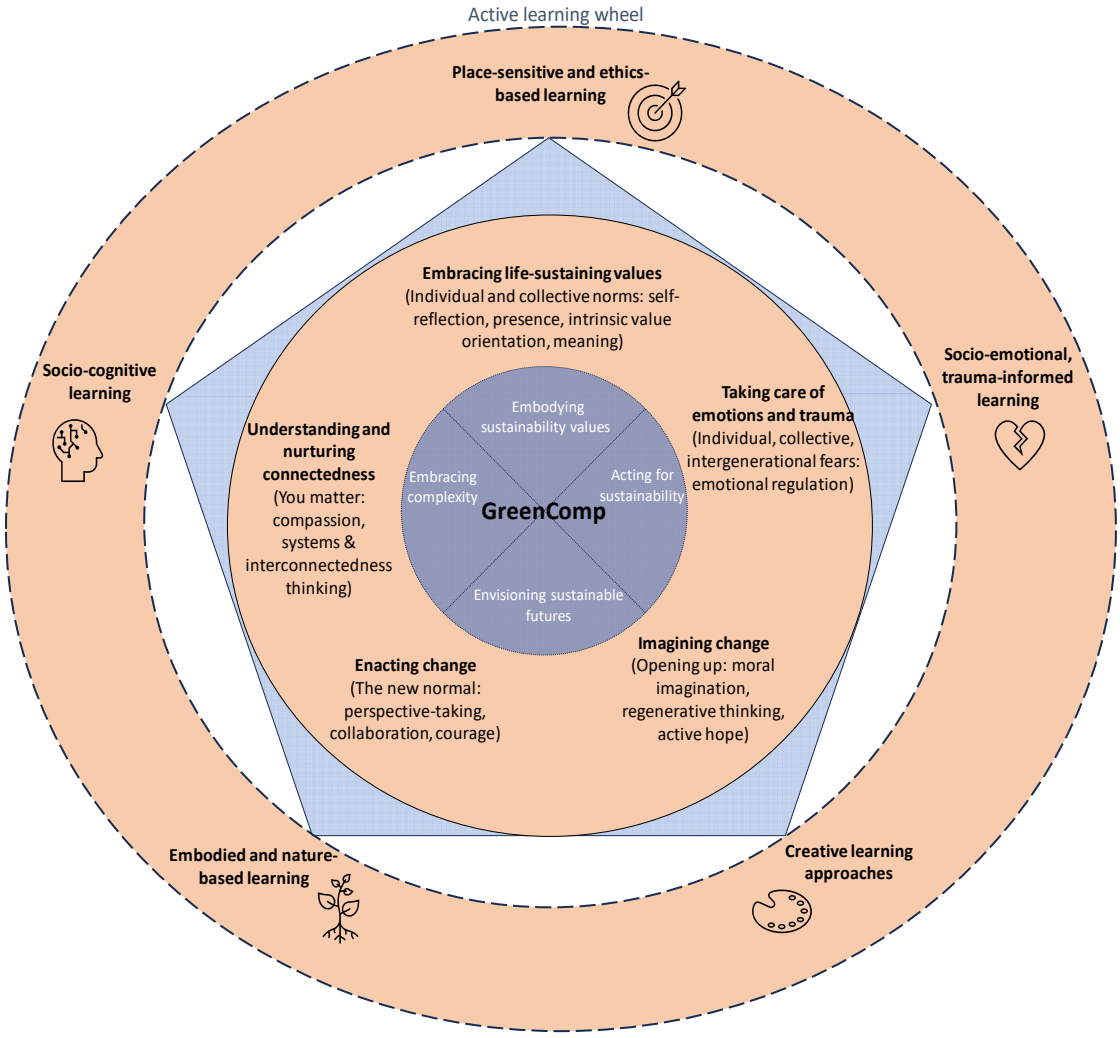


Figure 7: *Potential adaptation of GreenComp to support transformative resilience and reduce climate anxiety in children and youth. The illustrated adaptation (GreenComp Diamond) indicates the key aims, competency areas and capacities we must address, and with what kind of pedagogies, if we want to support transformative resilience and reduce climate anxiety in children and youth. The figure presents how GreenComp could be adapted to support transformative resilience and reduce climate anxiety in children and youth, based on the outcomes of this literature review and our first consultation and co-creation process. Importantly, all learning approaches must be understood as transversal, which is indicated by the learning wheel. Particularly socio-emotional and trauma-informed learning are non-negotiable, and they have to be mobilized at all times. Note: This is a simple illustration of some of our key outcomes; and the specific content, wording and design will be further developed and co-created in the context of our next project activities/deliverables.*

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8 Annex

8.1 Survey for data collection: Overview of questions and answers

The following email and link were sent out to the project partners and external experts to collect data for this report:

Dear ….,

As part of our ERASMUS+ project CLARITY, we are conducting a short survey to receive input for our competency and knowledge framework, a working document that will provide information that can support our planned project activities.

The aim of CLARITY is to enhance educators' skills for nurturing inner resilience and reducing climate anxiety of learners through trauma-informed and creative approaches that link inner and outer dimensions of transformation.

Being an expert in the field, your input would be very important. I therefore would be very grateful if you could fill in the survey until the 27th of November:

https://docs.google.com/forms/d/e/1FAIpQLSfa9gAWN9GK3U-z3oibzrBa9zS62fI5nwM3Rt4qezsPOKPnPA/viewform?usp=sf_link

In advance thank you for your support and input.

Warm regards,

Christine and Laureline

8.2 Additional information, figures and tables

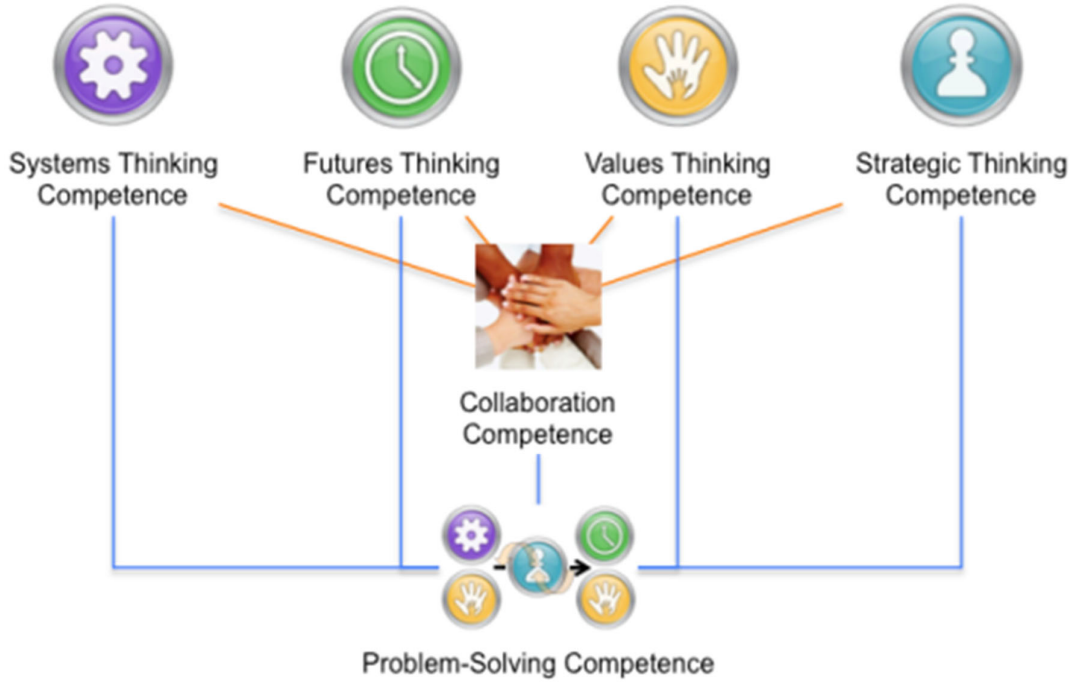

Figure A1: *Wiek et al.'s (2015) framework for competencies in higher education for sustainable development*

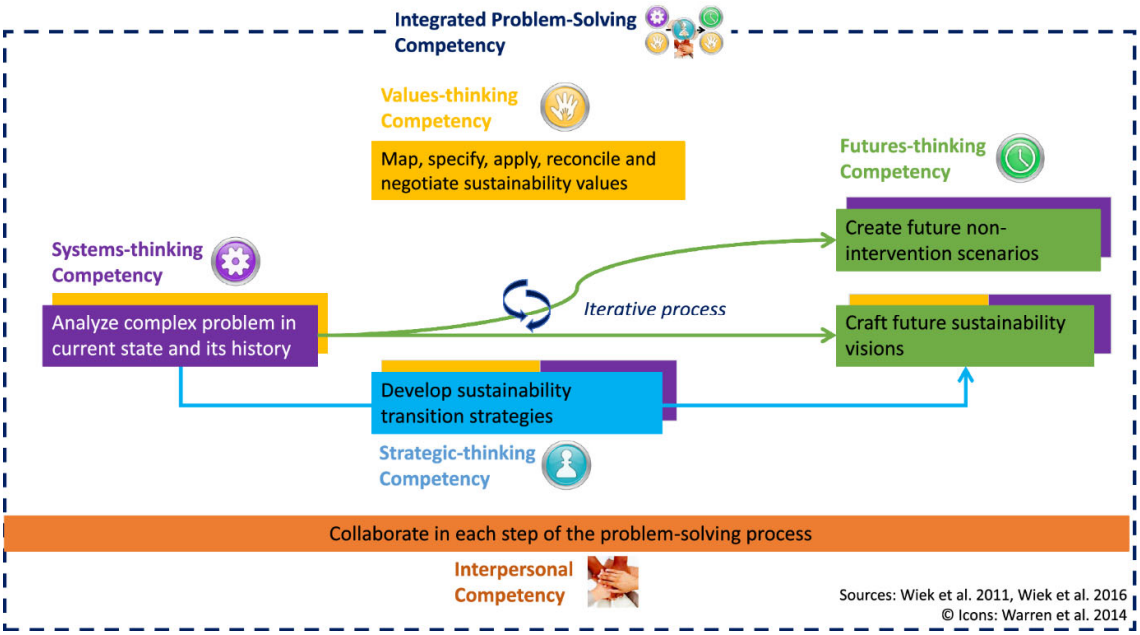

Figure A2: *Process around Wiek et al.'s (2015) framework for competencies in higher education for sustainable development*

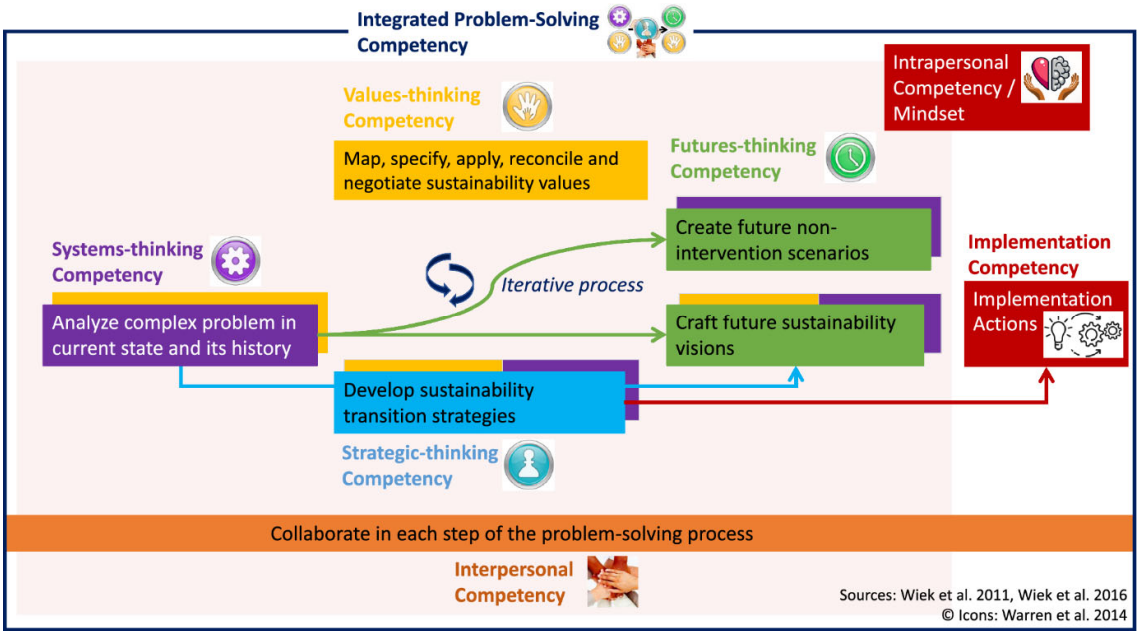

Figure A3: *Wiek et al.'s (2015) framework for competencies in higher education for sustainable development*

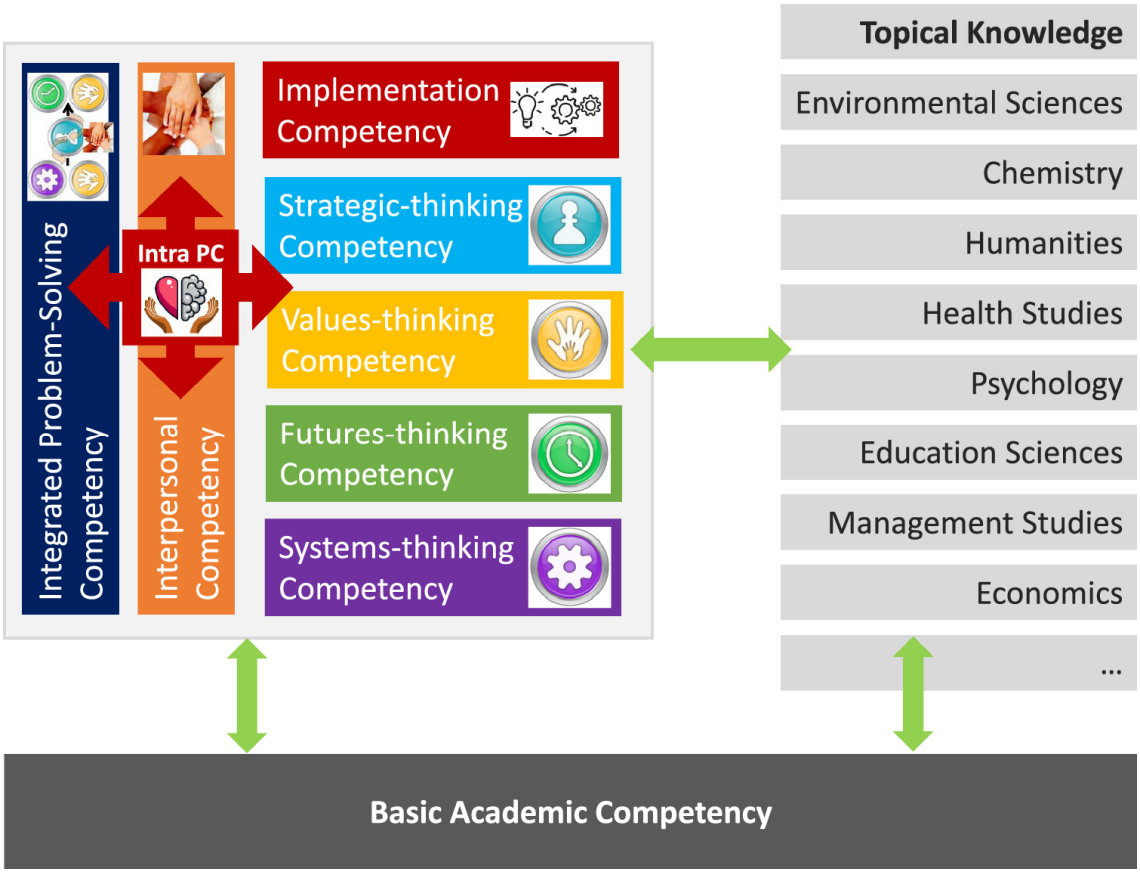

Figure A4: *Brundiers et al's (2021) development of Wiek et al.'s (2015) framework for competencies in higher education for sustainable development*

Table A1: *Overview of the clusters of transformative qualities/capacities (TCs) of the inner-outer transformation model and related inner development goals (IDGs). Source: Literature review presented in Wamsler et al. (2021) and empirical data and definitions adapted from Wamsler et al. (2020).*

Awareness (Being) **The ability to meet situations, people, others and one's own thoughts and feelings with openness, presence and acceptance**
Key qualities/ capacities: Self-reflection; self-awareness; presence; attention; acceptance; open-minded, openness (to listen, learn, adapt and change); cognitive flexibility; psychological resilience; meta-cognition; adaptive/ flexible response capacity **Related aspects:** Emotional regulation and processing; equanimity; discernment; emotional intelligence, mindfulness; related to social capacities of deep listening; capacities that allow a different kind of communication, reflective, not confrontational, polarizing/ judgmental Linked to all other clusters Intermediary factors: Subjective wellbeing; mental health (as opposed to climate anxiety, stress, etc.) & the other intermediary factors
Connection (Relating) **The ability and desire to see and meet oneself, others and the world with care, humility and integrity, from a place of empathy and compassion**
Key qualities/ capacities: Compassion (towards oneself, others, future generations, nature); empathy; kindness; human-nature connection; care; humility; integrity **Related aspects:** Love; solidarity; respect; seeing shared humanity; benevolence; generosity; gratitude; awe; emotional intelligence; mindfulness; related to social and servant capacities (cf. TC1) Linked to all other clusters Intermediary factors: Social trust & the other intermediary factors
Insight (Thinking & Collaborating) **The ability to see, understand and bring in more perspectives for a broader, relational understanding of oneself, others and the whole**
Key qualities/ capacities: Perspective-taking; perspective-seeking; relational awareness/ thinking; integral thinking; integration of different ways of knowing; sense-making **Related aspects:** Valuing diversity; openness, humility; optimism; hope; mindset of understanding; trust in people's truth; sense of reciprocity, inter/ intra-connectedness; emotional intelligence; mindfulness;

care and forgiveness regarding our history, previous and future generation, intersectional and decolonial approach; related to social capacities, such as co-creation

Linked to all other clusters, particularly TC1 (Awareness), e.g. openness; TC2 (Connection), e.g. humility, connection with our body, others and causes, changing the way we relate to others and the environment & TC5 (Agency), e.g. optimism; hope

Intermediary factors: Social identity, self-efficacy & the other intermediary factors

Purpose (Being & Collaborating)

The ability to navigate oneself through the world, based on insights into what is important (intrinsic, universal values)

Key qualities/ capacities: Intrinsic values; intrinsic value orientation; sense of purpose; sense of equity; sense of responsibility; future orientation; reciprocity, solidarity; equitable thinking; meaning-making

Related aspects: Inclusive/ equitable thinking; reflectivity of one's values and intentions; appreciation, gratitude; related to social ability to declare and connect based on one's stand; desire to contribute to the greater good; emotional intelligence; mindfulness; related to servant capacities

Linked to all other clusters, particularly TC4 (Insight), e.g. hope, optimism; TC2 (Connection), e.g. compassion, integrity & TC5 (Agency)

Intermediary factors: Social identity & the other intermediary factors

Agency (Acting)

The ability to see and understand broader and deeper patterns and our own role in the world in this regard, and to have the intention, optimism and courage to act on it

Key qualities/ capacities: Sense of agency; sense of empowerment; courage; optimism; action-oriented mindset; solutions-based mindset; creativity; qualities/ capacities to empower others

Related aspects: Hope; passion; perseverance; feeling able to act; feeling empowered to act; linked to capacities that enhance cooperation and co-creation of meaning and action-taking; emotional intelligence; mindfulness

Linked to all other clusters, particularly TC2 (Connection), e.g. compassion (being called to act/ relief suffering), integrity & TC4 (Purpose)

Intermediary factors: Self-efficacy; subjective wellbeing (as opposed to climate anxiety, stress, etc.); cognitive dissonance & the other intermediary factors

Being

Relationship to Self

Cultivating our inner life and developing and deepening our relationship to our thoughts, feelings and body help us be present, intentional and nonreactive when we face complexity.

Inner Compass
Having a deeply felt sense of responsibility and commitment to values and purposes relating to the good of the whole.

Integrity and Authenticity
A commitment and ability to act with sincerity, honesty and integrity.

Openness and Learning Mindset
Having a basic mindset of curiosity and a willingness to be vulnerable and embrace change and grow.

Self-awareness
Ability to be in reflective contact with own thoughts, feelings and desires; having a realistic self -image and ability to regulate oneself.

Presence
Ability to be in the here and now, without judgement and in a state of open - ended presence.

Thinking

Cognitive Skills

Developing our cognitive skills by taking different perspectives, evaluating information and making sense of the world as an interconnected whole is essential for wise decision-making.

Critical Thinking
Skills in critically reviewing the validity of views, evidence and plans.

Complexity Awareness
Understanding of and skills in working with complex and systemic conditions and causalities.

Perspective Skills
Skills in seeking, understanding and actively making use of insights from contrasting perspectives.

Sense-making
Skills in seeing patterns, structuring the unknown and being able to consciously create stories .

Long-term Orientation and Visioning
Long-term orientation and ability to formulate and sustain commitment to visions relating to the larger context .

Relating

Caring for Others and The World

Appreciating, caring for and feeling connected to others, such as neighbors, future generations or the biosphere, helps us create more just and sustainable systems and societies for everyone.

Appreciation
Relating to others and to the world with a basic sense of appreciation, gratitude and joy.

Connectedness
Having a keen sense of being connected with and/or being a part of a larger whole, such as a community, humanity or global ecosystem

Humility
Being able to act in accordance with the needs of the situation without concern for one's own importance.

Empathy and Compassion
Ability to relate to others, oneself and nature with kindness, empathy and compassion and address related suffering.

Collaborating

Social Skills

To make progress on shared concerns, we need to develop our abilities to include, hold space and communicate with stakeholders with different values, skills and competencies.

Communication skills
Ability to really listen to others, to foster genuine dialogue, to advocate own views skillfully, to manage conflicts constructively and to adapt communication to diverse groups.

Co-creation skills
Skills and motivation to build, develop and facilitate collaborative relationships with diverse stakeholders, characterized by psychological safety and genuine co - creation.

Inclusive mindset and intercultural competence
Willingness and competence to embrace diversity and include people and collectives with different views and backgrounds.

Trust
Ability to show trust and to create and maintain trusting relationships.

Mobilization skills
Ability to show trust and to create and maintain trusting relationships .

Figure A5: *The IDGs – definitions of the five clusters and associated transformative qualities/ capacities/ skills.*

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Table A2: *The vicious cycle of deteriorating personal collective and planetary wellbeing and flourishing: The intersection of mind and sustainability crises and its linkages to the human story of separation -from self, others, nature. The table indicates the current situation in modern societies, with the mind being a victim, barrier and root case of sustainability crises. Note: The presented data derives from the presented case study and further analyses conducted in the context of the Contemplative Sustainable Futures Program (www.contemplative.sustainable.futures.com).*

Facets of the human story of separation/ disconnection	**Illustrative expressions of the story of separation/disconnection and the associated intersection of mind, climate change and other societal crises**		
	The mind as a victim of sustainability crises	The mind as a barrier for adequate action to combat sustainability crises	The mind as a root cause of sustainability crises
Disconnection from self (e.g., one's thoughts, emotions, body sensations, intrinsic values, and motivation)	• Increasing stress, anxiety, worry, depression, and trauma as a result of increasing societal crises and modern societies' dominant social paradigms. • Lack of awareness re: one's own biases and negative coping strategies (e.g. denial). • Fight-flight-freeze responses; difficulty managing negative emotions. • Lack of mental resilience; feelings of powerlessness. • Deteriorating mental wellbeing and a lack of contentment.	• Biases, stress and anxiety increasingly guide decisions and actions (e.g., based on limited perspectives, short-term thinking). • Lack of inner capacities that support agency and engagement (e.g., losing sense of identity, meaning, hope, courage, gratitude). • Certain mechanisms to cope with stress, anxiety or denial can further reduce wellbeing and the capacity to act (e.g., drug abuse, interpersonal aggression, violence, crime). • Lack of holistic approaches (focused on information/ cognitive approaches).	• Consumption as a coping mechanism to deal with a lack of contentment, stress, anxiety (as opposed to managing difficult emotions, self-care). • Polarisation and extremism as (unconscious) coping strategies that foster the root causes of climate change. • Climate change denial or denial of own agency leading to business-as-usual. • Lack of awareness of internalised thought patterns and values that reinforce unsustainable social paradigms.
Disconnection from others	• Increasing feelings of isolation, loneliness and individualism. • Lack of feelings of belonging and community.	• Increased polarised and short-term thinking. • Reduced social cohesion. • Linked to reduced empathy and compassion for others due to increased stress, anxiety, etc. and as a result of social paradigms (e.g., believing ourselves to be separate and superior).	• People seen as a means to an end (e.g., as a resource for the economy). • Reduced circle of identity, feelings of care and responsibility for others.
Disconnection from nature (and the world at large)	• Reducing human-nature connectedness. • Reduced empathy and compassion towards nature.	• Focus on external solutions. • Linked to not seeing oneself as part of the nature, and not seeing oneself as part of the problem.	• Nature treated as an object and resource that can be controlled and should be managed for the benefit of humankind. • Reduced circle of identity, feelings of care, and responsibility for the environment.
Link to dominant social paradigms in modern societies	• A mechanistic and modern growth paradigm stresses individualism and independence (based on dualist and atomistic views), the importance of rational inquiry, science and		

	technology, and an associated biophysical discourse that views climate change as an external, environmental crisis. ● Focus on rational, self-centered, materialistic, utilitarian thinking. ● Focus on economic growth, wealth, achievement, control, independence, competition, and technology. ● Relatively little importance given to individuals in general, and their mental wellbeing in particular. ● Resultant 'isms': consumerism, materialism, individualism, colonialism, racism, classism, sexism.
Results	● Mutual influence and negative feedback loops, both horizontally and vertically, lead to reducing circles of identity, care, and responsibility, and ultimately deteriorating individual, collective, and planetary wellbeing and flourishing.

Table A3: *The virtuous cycle of increasing personal, collective and planetary wellbeing and flourishing: The intersection of mind and sustainability crises and its linkages to the human story of connection -to self, others, nature. The table indicates the potential of the mind (and associated methods and approaches) in moving from a vicious to a virtual cycle for improving personal, collective and planetary wellbeing and nourishing. Note: The presented data derives from the presented case study and further analyses conducted in the context of the Contemplative Sustainable Futures Program (www.contemplative.sustainable.futures.com).* â

Facets of the human story of oneness/connection	**Illustrative expressions of the story of re-/connection and the associated intersection of mind, climate change and other societal crises**		
	The mind as a safeguard for the impacts of sustainability crises (personal resilience)	The mind as a driver for holistic, sustainable action	The mind as the fundamental cause/ ground for sustainability and flourishing across scales
(Re)Connection to self (e.g., one's thoughts, emotions, body sensations, intrinsic values, and motivation)	● Reducing stress, anxiety, worry, as a result of: ● Awareness and acceptance of one's inner lives (emotions, thoughts, bodily sensations). ● Emotional resilience, well-being and positive emotions, including self-compassion, hope, courage and sense of agency.	● Better management of difficult emotions (self-regulation, self-management). ● Reduction in toxic coping mechanisms. ● Development of cognitive flexibility, cognitive reappraisal, and feelings of self-efficacy.	● Awareness and nourishment of intrinsic/virtuous values. ● Increasing awareness of the interconnectedness of sustainability crises and their linkages to (individual and collective) inner dimensions. ● More holistic perspectives and approaches to learning, understanding and acting, linking heart, mind and hand. ● Overcoming value-action gap e.g., more sustainable consumption, change in identity and values.
(Re)Connection to others	● Decreasing feelings of loneliness and social stress, as a result of: ● Seeing common humanity and feelings of compassion for others.	● Reduced prejudice, black-and white and us-versus-them thinking. ● Increase in social connectedness and pro-social behaviour.	● Feelings of inclusivity, belonging and care as drivers of (altruistic) behaviour. ● Increased decision-taking based on considerations of equity and other universal values.
(Re)Connection to nature	● Deep appreciation of nature. ● Recognition of the deep interconnectedness between self and nature.	● Taking responsibility for our role and responsibility to address sustainability crises. ● Compassion extending beyond humanity.	● Move towards more relational mindsets, from ego-system to eco-system awareness.

Link to dominant social paradigms in modern societies	● Move towards a more relational paradigm that foster care and regeneration through relational being, thinking and acting.
Results	● The way we relate to ourselves, others and our environment influences our behavior, and vice versa. This shows, in turn, our power and agency for moving from a vicious to a virtuous cycle of individual, collective, and planetary wellbeing and flourishing. ● The potential of our minds and associated methods and approaches in stemming the sustainability crises thus comes from their potential to foster fundamental aspects of connection.

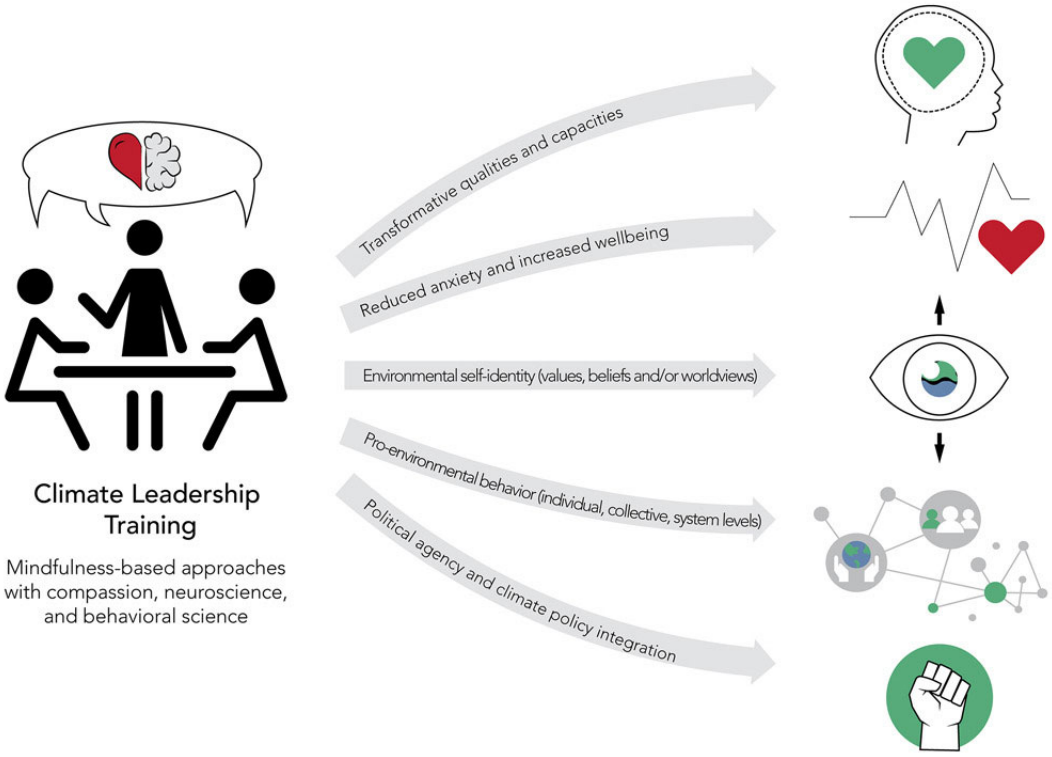

Figure A6: *Illustration of outcomes of program evaluations (based on Ramstetter et al., 2023; and related to Rupprecht & Wamsler, 2023; Wamsler et al., 2023)*

Table A4: *The following exercises are suggested to be used in combination with each other, depending on the topic. Source: metodbanken.terrapi.se*

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8.3 Glossary

Table A5: Green Comp glossary presented in Bianchi et al. (2022)

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 (sometimes also called informal 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
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
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
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

Apart from the glossary above, GreenComp also provides the following definitions in the framework description:

Learning for environmental sustainability is defined as aiming to "nurture a sustainability mindset from childhood to adulthood with the understanding that humans are part of and depend on nature" (Bianchi et al., 2022, p. 31).

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" (Bianchi et al., 2022, p. 12).

Climate resilience: GreenComp does not explicitly define the term climate resilience. We therefore use the definition of the latest IPCC (2022, p. 2920, glossary), which states that "climate resilience is the capacity of interconnected social, economic and ecological systems to cope with a hazardous event, trend or disturbance associated with climate change and its multiple impacts". It can be achieved by "social, economic and ecological systems responding or reorganizing in ways that either maintain their essential function, identity and structure", or" in ways that change their fundamental attributes". The latter is called transformative or transformational climate resilience. As the climate crisis intensifies, maintaining essential functions, identities and structures of existing systems could become untenable and counterproductive.

Transformative climate resilience thus requires that a group of societal actors take action to build climate resilience in ways that deliberately change the fundamental attributes of social-ecological systems in anticipation of climate change and its impacts. This deliberate action aims at addressing the root causes of vulnerability to the impact of climate change. This is because the very function, identity, and structures of social and economic systems that are in place today, and the way ecological systems are managed in many parts of the world, have both fueled the climate vulnerability of some population groups or ecosystems directly, and contributed to soaring greenhouse gas emissions.

As described in this document (see Sections 2-4), addressing the root causes of multiple forms of climate vulnerability, and fostering systemic change in a chaotic climate requires a deep understanding of how human minds work individually and collectively. We need to acknowledge how the climate crisis already affects people's minds by feeding anxiety, creating trauma, triggering fight-flight-freeze responses, and maintaining an illusion of separation with nature, others and our own emotions and bodies. This understanding is critical to supporting a shift in mindsets, values and practices, as a solid foundation for societal transformation. Achieving transformative climate resilience thus involves viewing the climate crisis as the result of a deep relational crisis, and developing knowledge, skills and tools to undertake profound work at the junction of inner and outer transformation. It also means embodying and engaging in transformative change with our communities, including to regenerate ecosystems.

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Picture backside: Malmö, Sweden, Unsplash

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