

Climate Change Competency Framework for Educators (C³FE)

A Practical Framework for Strengthening
Climate Change Education

Acknowledgements

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List of Abbreviations

C ³ FE	Climate Change Competency Framework for Educators
CCE	Climate change education
OECD	Organisation for Economic Co-operation and Development
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UNU-IAS	United Nations University Institute for the Advanced Study of Sustainability

Glossary

Term	Definition	Source
Climate emotion	A broad category of feelings experienced in response to changes in the world that are directly or indirectly related to climate change. These emotions can range from anxiety and fear to joy and hope or overwhelm that learners and educators may experience when learning about climate change and its impacts.	UNESCO. (2024). Greening curriculum guidance: Teaching and learning climate action.
Climate justice	Justice that links development and human rights to achieve a human-centred approach to addressing climate change, safeguarding the rights of the most vulnerable people and sharing the burdens and benefits of climate change and its impacts equitably and fairly.	UNESCO. (2024). Greening curriculum guidance: Teaching and learning climate action.
Climate literacy	The understanding of the facts, drivers and impacts of climate change, as well as the urgency of climate emergency. It also emphasizes the development of values, attitudes and behaviours that enable individuals to understand climate change, evaluate information, and take informed actions for mitigation and adaptation.	Sato, F. E., & Park, J. (2025). A systematic review of climate change literacy assessment methods. <i>The Journal of Environmental Education</i> , 56(1), 65-83.
Evidence-based reasoning	A systematic process in which learners integrate the best available scientific evidence on climate change with contextual knowledge and practical considerations to critically evaluate information and make informed judgments and decisions about climate change. This includes interpreting datasets, graphs and scientific reports and helping learners address misinformation.	Adapted from UNESCO. (n.d.). Evidence-based research.
Formative assessment	Ongoing checks of student understanding during lessons (not only at the end of a unit), used to give actionable feedback and adjust teaching in real time. In C ³ FE, this includes self-assessment and peer assessment focused on improving climate-related analyses.	UNESCO. (2024). Greening curriculum guidance: Teaching and learning climate action.
Futures literacy	The capability to imagine, question and use the future as a resource for better understanding the present and acting with intention. It empowers individuals to prepare, recover and invent in the face of change by enhancing their imagination and ability to anticipate future scenarios. Teachers may help learners explore how present choices, values and policies shape long-term outcomes.	UNESCO. (n.d.). Futures literacy.

Learner agency	A learner's sense that they can make a meaningful difference, including the confidence and motivation to take informed, responsible action on climate and sustainability issues, both individually and collectively.	United Nations University Institute for the Advanced Study of Sustainability. (2025). Action-oriented pedagogies for education for sustainable development (AOP for ESD): Educators toolkit .
Media and information literacy	A set of competencies that empower individuals to access, evaluate, create and share climate-related information and media content critically, ethically and effectively across all formats and platforms.	Adapted from UNESCO. (n.d.). Media and information literacy .
Rights-based approach	An approach to climate education that connects climate change to human rights, recognizing that everyone has the right to a safe and healthy environment, and that climate impacts are a matter of justice, not just science. Links to climate justice and equity across different learning activities.	UNESCO. (2024). Greening curriculum guidance: Teaching and learning climate action .
Systems thinking	The ability to recognize and understand relationships; to analyse complex systems; to think of how systems are embedded within different domains and different scales; and to deal with uncertainty. In climate education, it helps learners move beyond simple cause-and-effects toward understanding the bigger picture.	UNESCO. (2017). Education for Sustainable Development Goals: Learning objectives .

Executive Summary

Climate change has emerged as the most pressing and multifaceted challenge of our time. Its accelerating effects, including rising temperatures, biodiversity loss, sea-level rises and deepening inequalities, are disrupting livelihoods and ecosystems worldwide (IPCC, 2023). Addressing these challenges demands profound structural changes and transformation across interconnected systems — from governance and finance to education and technology, ensuring they are aligned with long-term sustainability goals.

In this regard, climate change education (CCE) is increasingly recognized as a key enabler for individuals and communities to meaningfully contribute to local and global climate action. It equips them with the knowledge, skills and attitudes needed to tackle the climate crisis. Building on the commitments under the United Nations Framework Convention on Climate Change (UNFCCC) adopted in 1992, Article 12 of the Paris Agreement establishes learning as a cornerstone of the global climate response (UNFCCC, 2015). Yet the growing importance of CCE also raises practical questions: Are educators ready to translate climate education goals into effective teaching and learning? What competencies do they need to do so? Are those competencies globally relevant yet locally adaptable to the specificities of climate change in different countries and regions?

The Climate Change Competency Framework for Educators (C³FE) was developed by the United Nations University Institute for the Advanced Study of Sustainability (UNU-IAS) in response to these questions. Drawn on an extensive and in-depth review of 20 internationally acclaimed frameworks published between 2015 and 2025, three recurring and persistent gaps in the global landscape of CCE were found. **First**, the reviewed frameworks often provide broad and overlapping competencies, with limited prioritization around educators’ professional decision-making. **Second**, while the reviewed frameworks increasingly acknowledge the importance of empowering learners to take action, climate action is often framed as a learning outcome, with less attention to how educators can scaffold learners’ progression from understanding to meaningful action. **Finally**, assessment remains noticeably underdeveloped, particularly assessment related to action, values and socioemotional dimensions. Together, these gaps can make it difficult for educators to translate broad CCE ambitions into coherent teaching, learning and assessment practices.

The C³FE framework addresses these gaps through explicitly centring educators’ professional practice across formal and non-formal education and lifelong learning. It uses the term “educators” deliberately to extend beyond schoolteachers and recognize the broader range of professionals who facilitate learning about climate change. The framework provides a coherent, educator-focused structure to build the capacity of educators and to support effective teacher training for quality CCE.

Climate Change Competency Framework for Educators (C³FE)

The C³FE framework is structured around five core domains that are designed to support educators in navigating the complexity of CCE by clarifying (i) what to teach, (ii) how to teach, (iii) how to care for learners, (iv) how to assess and (v) how to support action (Table 1).

Domain 1 advocates for going beyond the conventional climate science literacy by considering the social dimensions of climate change and taking a rights-based perspective on its causes, consequences and responses.

Domain 2 positions climate pedagogy as a deliberate, reflective and context-responsive professional practice that is central to fostering learners' understanding, engagement and readiness for climate action.

Domain 3 explores how educators care for learners in CCE, highlighting fostering learners' sense of connection to themselves, to others and to the natural environment.

Domain 4 focuses on a comprehensive assessment of learners' understanding of climate change, their values and feelings in relation to it, and how they act on it in real life.

Domain 5 centres on how educators support learners in translating climate-related knowledge, skills and attitudes into meaningful participation, action and agency building.

Table 1: Summary of the five domains of C³FE

What to teach	Rights-based climate literacy and systems understanding	Build an accurate, critical and contextualized understanding of climate change, evidence, information, interconnected systems, futures and justice.
How to teach	Engaged and innovative climate pedagogy	Integrate climate topics into teaching using engaging, participatory and context-responsive approaches, while supporting educators' professional growth and well-being.
How to care for learners	Social-emotional and relational competence	Recognize climate-related emotions, foster respectful and inclusive learning environments, and strengthen learners' connection to self, others and the natural world.
How to assess	Holistic assessment	Use evidence of understanding, authentic performance and formative feedback to assess learning beyond factual recall.
How to support action	Participation and agency building	Support responsible decision-making, collective participation, civic engagement and solution-oriented action.

By framing CCE through five domains, the proposed framework bridges the gap between global policy aspirations and classroom realities. It positions educators not only as transmitters of climate knowledge, but as pedagogical designers, ethical facilitators and assessors of transformative learning. The framework thus offers an operational model that supports educators in navigating complexity, fostering agency and sustaining meaningful CCE across formal schooling and non-formal education contexts.

Chapter I – About C³FE

1.1 Purpose and audience

C³FE articulates core domains of professional competence that educators may need to acquire to support quality climate change education across formal, non-formal and lifelong learning settings. The framework is intended primarily for education policymakers, teacher education institutions, professional development providers, school leaders, education programme designers and educators. It can be used as a reference when discussing what educator readiness for CCE should involve, and how professional learning can move beyond a narrow focus on climate content to empowering educators to facilitate action-oriented learning.

At the policy and system level, C³FE can inform teacher education priorities, competency standards, curriculum support and professional development. At the institutional and programme level, it can guide the design of pre-service and in-service teacher training. At the practitioner level, it provides concrete examples of how each competency may become visible in teaching practice.

1.2 Applying C³FE in different contexts

In practice, the flexible and context-responsive use of C³FE involves four considerations.

1. *Prioritize without losing the whole*

While all five domains are important, they are not intended to be implemented in a fixed sequence or with equal emphasis in every setting. Instead, educators, schools and policymakers may prioritize and scale domains based on their environmental priorities, institutional capacity and education system conditions.

In contexts with strong policy support and resources, the framework may be implemented in a more comprehensive and integrated way across all domains. In contrast, in low-resource settings, implementation may begin with a smaller number of domains that are most immediately relevant and feasible. For example, teachers may focus on connecting climate learning to local issues, supporting students' well-being in the face of environmental stress or engaging learners in simple community-based actions.

2. *Ground learning in local realities*

Climate change is global, but its effects are experienced locally. Adaptation should therefore reflect environmental conditions, livelihoods, cultural knowledge, language, infrastructure and lived experience. In disaster-prone contexts, learning may focus on preparedness and community resilience. In rural or island settings, educators may draw more strongly on local ecosystems, livelihoods and community knowledge. Localization should also consider who may be excluded by language, disability, geography, digital access or other barriers. This flexibility helps ensure that climate change education remains relevant, meaningful and actionable for learners in different contexts.

3. *Build progressively*

C³FE supports gradual progression. Educators can begin with existing practice and build towards more complex approaches over time, depending on available time, training and support. For example, assessment may start with simple checks of student understanding during lessons and later expand to include more complex real-world tasks as capacity grows. An educator who already checks understanding through discussion can strengthen this practice by introducing clearer criteria, then later add self-assessment, peer feedback or authentic performance tasks. Similarly, a class that begins with a local awareness activity can progress towards stakeholder engagement and more sustained collective action.

4. *Use the framework to assess the readiness*

C³FE provides a foundation for the development of a diagnostic instrument that enables readiness assessment and allows data-based prioritization of specific domains over the others. Readiness data could also support teacher education authorities and ministries of education in making more evidence-informed decisions about where capacity-building and institutional support are most needed.

Box 1: An integrated classroom example

In a rural, flood-prone community, a primary school teacher integrates climate change into an existing social studies lesson without requiring additional materials. The lesson begins with students sharing their experiences with recent floods. As they speak, the teacher notes key ideas on the board, such as causes, impacts and responses, to check their initial understanding. At the same time, the classroom becomes a space where both ideas and feelings are acknowledged, and students listen to one another with respect.

Students then work in small groups to identify possible causes of flooding and their impacts on their community. During group work, the teacher moves between groups and asks simple questions such as “Why do you think this happens?” or “Can you give an example?” These questions help the teacher check understanding and support students’ thinking.

As a follow-up activity, students draw simple maps of their village to show areas at risk during floods and suggest ways to reduce risk. The teacher uses a few clear criteria to review the work. For example, the teacher checks whether students can explain the cause of flooding, identify a local impact and suggest realistic action.

At the end of the lesson, students share their ideas and complete a short reflection, either orally or in writing. For example, they may describe one thing they learned and one action they can take at home. The teacher uses these responses, along with observations during the lesson, to understand what students have learned and where they may need more support.

This example shows how the C³FE framework can be flexibly prioritized and scaled in different country contexts, including differences in environmental policies, institutional capacity and education systems.

Chapter II – Why C³FE?

2.1 From policy ambition to classroom practice

International policy already recognizes education as a cornerstone of the global climate response. The Sustainable Development Goals (SDG) target 4.7 aims to “ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles” (UN, 2015). Article 12 of the Paris Agreement and the Action for Climate Empowerment agenda under the UNFCCC identify education and training as important for enabling people to understand climate change and participate in responses (UNFCCC, 2015). National efforts to integrate climate change into education are also expanding, but policy attention has not yet translated consistently into educators’ capacity or classroom practice.

Figure 1: Gaps between policy ambitions and classroom realities

87% of 80 countries had laws, policies or plans supporting climate change integration in education; only 38 per cent had policy or government frameworks specifically focused on CCE. <i>UNESCO, 2023a</i>	95% of more than 58,000 surveyed teachers said teaching about climate change is important, while fewer than 40 per cent felt confident teaching it and only 25 per cent felt able to teach how to take climate action. <i>UNESCO and Education International, 2021</i>
71% of teachers surveyed across six low- and middle-income countries answered at least one basic climate-related question incorrectly, although nearly 87 per cent reported teaching climate-related topics. <i>World Bank, 2024</i>	40% of teachers surveyed across 144 countries reported significant difficulty assessing learners’ ability to act in line with education for sustainable development (ESD) principles. <i>UNESCO and Education International, 2021</i>

While educators are expected to play a critical role in building the foundation for societal change, they continue to face multiple barriers, including limited professional development, insufficient time for collaboration and curriculum development, and a lack of pedagogical guidance and classroom-ready materials (Parry & Metzger, 2023; UNESCO & Education International, 2021). Strengthening climate literacy for all, therefore, requires building the capacity of educators, preparing them to serve as catalysts of wider transformation (Beach, 2023).

Teachers consistently report that the low emphasis on CCE in the national curriculum is a major barrier (Greer et al., 2023). This highlights the disconnect between policy intentions and the reality in classrooms on the ground: teachers are increasingly expected to deliver ambitious content amid already rigid curricula but are asked to do so without proper resources.

In recent years, there have been increasing national efforts aimed at mainstreaming climate change in school curricula. However, where implemented, CCE has largely focused on cognitive learning — building knowledge and understanding — across all educational levels (UNESCO, 2019). At the same time, behavioural and social-emotional learning that shape values and skills necessary for real-world action and lifelong commitment to sustainability remain largely absent from formal CCE.

Ultimately, these challenges reveal the need for a more coherent and operational ecosystem for CCE. To drive systemic transformation, governments must prioritize investing in educators — through training, resources and professional recognition.

2.2 How C³FE was developed

C³FE was developed through a staged process. An initial mapping identified 20 international and regional reports, frameworks and guidance related to climate change education, green skills and climate literacy published between 2015 and 2025. The analysis identified recurring competencies, structures and critical gaps. It is important to note that the analytical review was designed to identify relevant and widely acclaimed international and regional frameworks rather than provide a systematic review of all academic literature. Additionally, the search was limited to publicly available, open access, English-language reports.

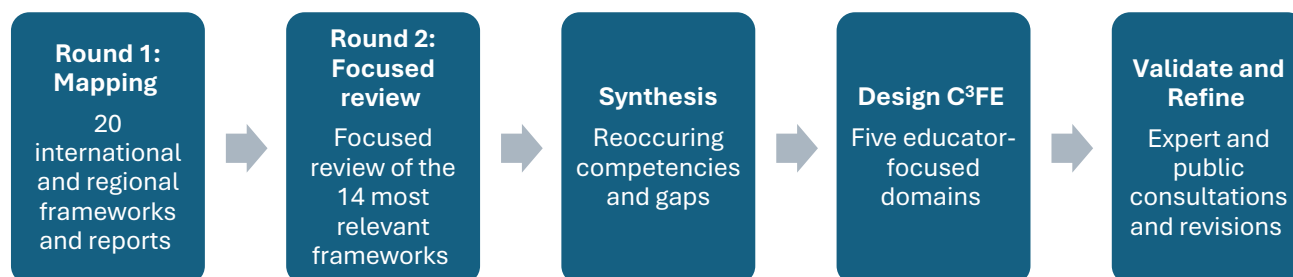
A second, more focused review examined the 14 most relevant frameworks in greater depth, including both educator- and learner-focused frameworks as learner competencies help define what educators need to enable through their teaching (see Table 8). The second review focused on a narrower pool of frameworks due to the following reasons: i) while international organizations such as UNESCO and the World Bank dominated the discourse, regional coverage was uneven with notable underrepresentation from Africa and Latin America; ii) some of the selected frameworks were often too broad, underprioritized teachers and lacked clarity on target learners; and iii) during the review period, a few critical frameworks were newly published. Word-frequency analysis and qualitative content analysis were used as complementary approaches to identify convergence and areas that remained underdeveloped.

Following the initial development of C³FE, the framework was further refined through expert consultation to strengthen its clarity, inclusivity, adaptability, comprehensiveness and practical relevance (Figure 2). Experts from Korea Environment Corporation (K-eco), UNESCO Regional Office for South Asia and McGill University reviewed the framework across the five criteria during the consultation meeting on 24–25 March 2026. Each criterion was scored on a scale of 1 to 5. Experts also provided qualitative feedback on required revisions and prioritization of recommended changes. Overall, the experts evaluated the framework as strong in conceptual relevance and design (4.67 out of 5), with solid performance in comprehensiveness and adaptability (4.33 out of 5). Feedback suggested improvements in clarity and inclusivity (3.67 out of 5), which were addressed through refining the initial draft of the framework. Particularly, the domain descriptions were clarified, while simplifying academic jargon to make the framework more educator-friendly.

The final version of the framework was further revalidated at the public consultation that took place as part of the 2026 Global Sustainable Development Congress (GSDC) organized by

Times Higher Education in Jakarta, Indonesia. The consultation was co-organized by UNU-IAS and UNESCO Jakarta Office on 22 June 2026 and involved educators, youth, education stakeholders and a wider audience, who participated in the roundtable discussions on the C³FE domain. During the consultation, the discussions reaffirmed the common challenges educators face when attempting to teach CCE in their local environments.

Figure 2: C³FE development process



2.3 What the review of existing frameworks showed

As mentioned, recent global and regional efforts have substantially advanced the articulation of CCE competencies, reflecting a growing recognition that education plays a critical role in climate mitigation, adaptation and the pursuit of just transitions. Collectively, these frameworks represent a significant shift away from content-driven environmental education toward more holistic and transformative approaches to learning for sustainability.

At the same time, the conducted review suggests that this expanding body of work, while conceptually rich, presents several challenges for classroom enactment, particularly for educators.

One recurring issue concerns the breadth and structure of competencies articulated across frameworks. Many documents intentionally adopt comprehensive approaches in order to capture the complexity of climate change; however, this has resulted in extensive and sometimes overlapping competency lists, with limited prioritization or integration. While competencies such as systems thinking, futures thinking and socioemotional skills are consistently emphasized (e.g. EU, 2022; ADB, 2024; CLARITY, 2025), they are not always organized in ways that align with educators' professional decision-making processes. As a result, educators may find it difficult to translate these competencies into concrete instructional goals, education practices or assessment strategies.

A second tension identified in the present analysis relates to the positioning of climate action within CCE frameworks. Many frameworks clearly affirm the importance of action-oriented and participatory learning, signalling an important move beyond awareness-raising. However, action is often conceptualized primarily as a learning outcome rather than as a pedagogically scaffolded process. Many articulate transformative and transferable competencies associated

with climate action (e.g. ADB, 2024) yet offer limited guidance on how educators might design learning sequences that support learners' progression from understanding climate issues to engaging in participation and collective action. This design gap is particularly consequential given the earlier finding that schoolteachers report strong motivation to teach for climate action, but comparatively low confidence in how to do so.

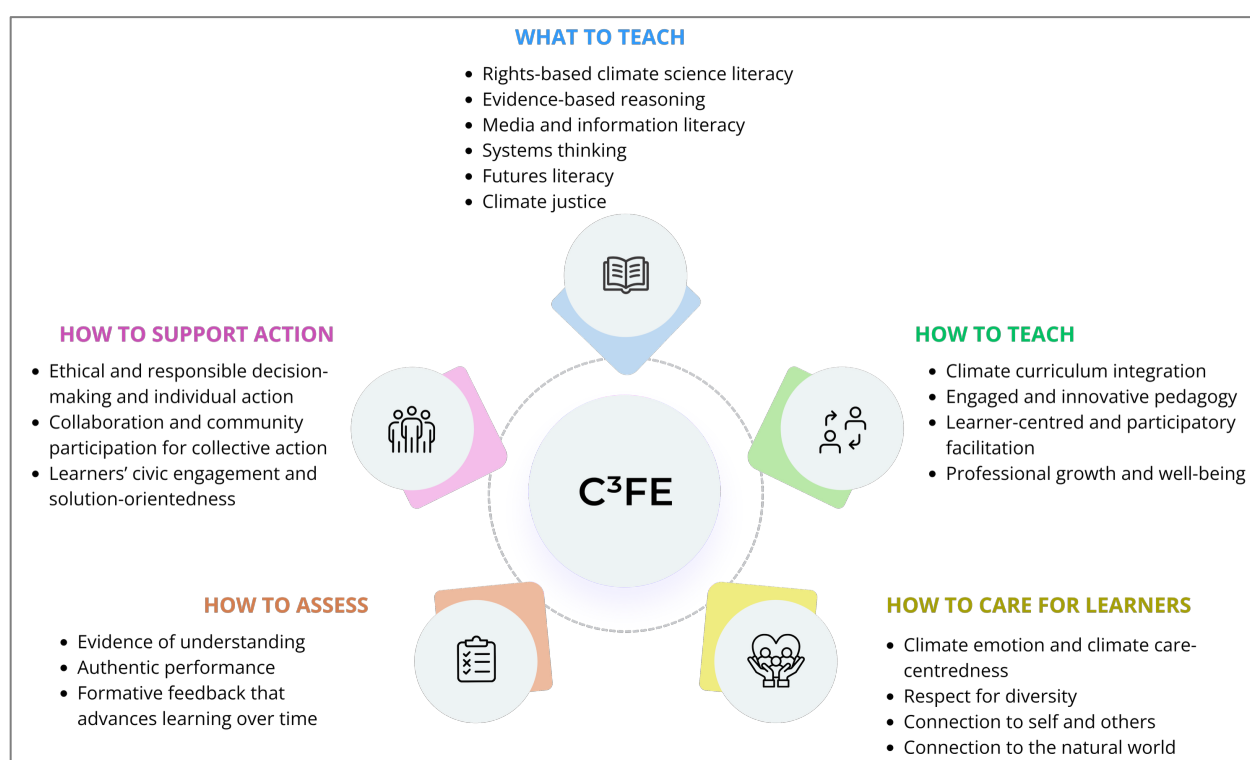
Finally, the analysis identifies assessment as a particularly underdeveloped area across the reviewed frameworks. While recent learner-focused initiatives, such as the OECD's preliminary Programme for International Student Assessment (PISA) 2029 Climate Literacy Framework (2025), represent important progress in conceptualizing climate-related competencies, most teacher-oriented CCE frameworks provide limited guidance on how to assess learning related to climate action, values and socioemotional development. In practice, this lack of assessment clarity makes it difficult for teachers to align climate learning with existing curricular structures and accountability mechanisms, contributing to the continued marginalization of CCE within formal education systems.

Chapter III - C³FE structure

3.1 C³FE at a glance

The C³FE framework responds to these gaps by synthesizing insights from the reviewed international and regional frameworks and guidance on CCE while explicitly centring educators' professional practice across formal and non-formal education and lifelong learning. It is structured around five domains: i) what to teach, ii) how to teach, iii) how to care for learners, iv) how to assess learning and v) how to support meaningful action (Figure 1).

Figure 3: Five domains of C³FE



3.2 How the domains work together

The five domains are designed to be interdependent. Climate knowledge without appropriate pedagogy may remain abstract. Participatory pedagogy without care for learners can fail to recognize emotional well-being. Action without evidence, ethical reflection or attention to context can become superficial. Assessment that focuses only on factual recall can miss the deeper competencies CCE is intended to develop.

For this reason, C³FE should be read as an integrated framework. A single learning experience can activate several domains at once. For example, educators may guide learners to investigate

a local flood risk using data and community knowledge (What to teach), work collaboratively to analyse causes and responses (How to teach), discuss how the issue affects different groups in their community and how it makes them feel (How to care for learners), develop and present a risk-reduction proposal (How to support action), and receive feedback from peers against clear criteria (How to assess).

Table 2: Educators' competencies under C³FE

Note: *Observable practices are not intended as a universal checklist or compliance instrument. They can be adapted to the subject area, learner age, educational setting and local context.*

Competencies marked with an asterisk may particularly benefit from local contextualization. Educators are recommended to connect learning activities to locally relevant environmental issues and social, cultural and economic contexts.

Domain	ID	Core Competencies	What it can look like in practice
WHAT TO TEACH	CLIMATE TOPICS COVERED		
	1.1	**Rights-based climate science literacy	Learning activities exploring real-world climate challenges and existing responses relevant to the subject are included in teaching and connected, where possible, to local context.
	1.2	Evidence-based reasoning	Learning activities that evaluate climate-related claims using evidence such as data, research findings or case studies are incorporated.
	1.3	Media and information literacy	Learning activities that critically examine and compare climate-related information from two or more media and information sources are included.
	1.4	Systems thinking	Learning activities that explicitly connect and encourage learners to identify links between two or more human, economic and ecological systems are used.
	1.5	**Futures literacy	Future-oriented learning activities where learners explore possible climate futures and solutions with reference to local and regional realities are used (e.g. scenario building, future storytelling).
	1.6	**Climate justice	Learning activities that explore how climate change affects different people and communities are included, incorporating examples and insights from both local and global contexts.
HOW TO TEACH	TEACHING PRACTICE IN PLACE		
	2.1	Climate curriculum integration	A concrete plan to integrate climate-related topics within the subject area is developed in accordance with policy standards.
	2.2	Engaged and innovative climate pedagogy	Inquiry-based, action-oriented activities that ask learners to analyse a climate-related issue and develop solutions in collaboration with peers and community members are incorporated.

Domain	ID	Core Competencies	What it can look like in practice
	2.3	Learner-centred and participatory facilitation	Learning activities are designed so that learners collaboratively explore, investigate and discuss climate-related issues and co-design their learning experience.
	2.4	Professional growth and well-being	Participation in relevant professional learning opportunities and collaboration with peer networks.
HOW TO CARE FOR LEARNERS	CARE AND VALUES FOSTERED		
	3.1	**Climate emotion and climate care-centredness	Structured opportunities for learners to reflect on and openly express feelings and thoughts about climate and environmental issues are created with particular attention paid to cultural and social contexts (e.g. traditions, values).
	3.2	Respect for diversity	Learning activities that encourage learners to consider different cultural, social or community perspectives on climate change, including traditional and Indigenous knowledge, are included.
	3.3	**Connection to self and others	Exercises that ask learners to reflect on how climate change relates to their own lives, communities and identities are used.
	3.4	**Connection to the natural world	Learning activities and exercises that include learners' observation, discussion and interaction with natural environments are incorporated.
HOW TO ASSESS	PROGRESS TRACKED		
	4.1	Evidence of understanding	Assessment that measures learners' conceptual understanding of a climate-related issue, reasoning quality and evidence used is administered.
	4.2	Authentic performance	Assessment carried out through real-world tasks, such as developing solutions to real-world climate-related local challenges.
	4.3	Formative feedback that advances learning over time	Learners are supported through actionable, constructive feedback, including self- and peer assessment, that focuses on improving analyses of climate change impact and/or developed solutions.
HOW TO SUPPORT ACTION	ACTIONS INITIATED		
	5.1	Responsible and ethical decision-making and individual action	Responsible and ethical climate-related practice is identified and actively practiced by learners and modelled by educators within classrooms, schools or learning environments (e.g. waste sorting system, responsible materials use).
	5.2	**Collaboration and community participation for collective action	Structured and continuous opportunities for learners to meaningfully interact with school actors, families and community stakeholders on sustainability issues and local initiatives are established.
	5.3	**Learners' civic engagement and solution-orientedness	A simple action plan or proposal to institutions and decision makers, including community leaders, policymakers and industries, for addressing a local sustainability issue is developed by learners.

Chapter IV - C³FE domains

4.1 Domain 1. What to Teach: Rights-based Climate Literacy and Systems Understanding

WHAT IT MEANS

Domain 1 focuses on what educators teach in CCE, while emphasizing that this responsibility extends beyond content coverage. It advocates for going beyond the conventional climate science literacy by considering the social dimensions of climate change and taking a rights-based perspective on its causes, consequences and responses.

Domain 1 emphasizes the professional ability of educators to explain climate change accurately and connect complex climate issues to learners' lived experiences and local contexts. It includes using scientific evidence, critically examining climate information, understanding connections between environmental and human systems, considering climate justice and exploring possible climate futures. Educators, therefore, are not only expected to possess climate-related knowledge but should be able to translate complex ideas into coherent learning experiences that are developmentally appropriate, culturally relevant and instructionally meaningful. The core competencies of this domain are summarized in Table 3.

WHY IT MATTERS

Global guidance on CCE emphasizes that climate literacy must begin with a sound understanding of human-induced climate change, Earth systems, and the interactions between climate processes and human activities (OECD, 2025; EIAP, 2021). At the same time, it involves more than factual accuracy. Thus, educators are expected to be able to interpret evidence, evaluate claims, navigate uncertainty and connect global climate processes to local environmental and social contexts.

This is particularly important in contemporary information environments characterized by misinformation, disinformation and contested narratives around climate change (UNESCO, 2024a; UNDP, 2025). As individuals increasingly obtain information through digital and social media platforms and generative artificial intelligence (AI), the ability to critically assess sources, identify misinformation and understand how narratives are constructed has become essential for informed decision-making (Atkins et al., 2024). With this in mind, media and information literacy forms an important part of climate literacy, helping learners distinguish credible scientific sources from misleading or unsupported information and critically evaluate climate-related claims.

Climate change is also shaped by interconnected environmental, social, economic and political systems. Educators are therefore expected to help learners move from simple cause-effect reasoning toward understanding complex socioecological systems. This includes guiding students to identify connections, feedback loops and leverage points, and to recognize how

individual and collective actions influence larger systems. Knowledge of climate solutions, including mitigation and adaptation, further supports learners in considering different responses, their trade-offs and co-benefits, and how present decisions can shape future outcomes (OECD, 2025; UNESCO, 2024a).

IN PRACTICE

In CCE, educators might ask learners to compare climate-related claims from several information sources and identify what evidence each source uses. In another activity, learners might map the links between a local climate impact, livelihoods, public services and ecosystems, then explore different future scenarios and possible responses. The emphasis is on making climate knowledge accurate, connected, critical and relevant to lived experience.

Table 3: Core Competencies, Domain 1 (What to Teach)

<i>Domain</i>	<i>ID</i>	<i>Core Competencies</i>	<i>What it can look like in practice</i>
WHAT TO TEACH		CLIMATE TOPICS COVERED	
	1.1	Rights-based climate science literacy	Learning activities exploring real-world climate challenges and existing responses relevant to the subject are included in teaching and connected, where possible, to local context.
	1.2	Evidence-based reasoning	Learning activities that evaluate climate-related claims using evidence such as data, research findings or case studies are incorporated.
	1.3	Media and information literacy	Learning activities that critically examine and compare climate-related information from two or more media and information sources are included.
	1.4	Systems thinking	Learning activities that explicitly connect and encourage learners to identify links between two or more human, economic and ecological systems are used.
	1.5	Futures literacy	Future-oriented learning activities where learners explore possible climate futures and solutions with reference to local and regional realities are used (e.g. scenario building, future storytelling).
	1.6	Climate justice	Learning activities that explore how climate change affects different people and communities are included, incorporating examples and insights from both local and global contexts.

4.2 Domain 2. How to Teach: Engaged and Innovative Climate Pedagogy

WHAT IT MEANS

Domain 2 focuses on how educators teach in CCE and emphasizes how climate change is taught is as important as what is taught. It positions climate pedagogy as a deliberate, reflective and context-responsive professional practice that is central to fostering learners' understanding, engagement and readiness for climate action. At the same time, Domain 2 recognizes that there is no single best method for effective CCE.

Climate pedagogy involves designing coherent and interdisciplinary learning sequences that align climate learning with curriculum standards, policy priorities and local sustainability contexts (McCowan, 2023; Mochizuki & Bryan, 2015). Educators may draw on a range of engaged and innovative teaching approaches. These include real-world problem solving; asking questions; and exploring ideas, group discussions and interdisciplinary projects depending on their context. The domain highlights educators' ability to link climate topics to what they already teach, actively involve students in learning and support participation. It also recognizes that effective climate teaching is supported by educators' ongoing professional growth and attention to well-being. The core competencies of this domain are summarized in Table 4.

WHY IT MATTERS

Climate change is a complex phenomenon, which is connected to many subjects, issues and areas of learners' lives. Integrating climate change across curricula can help move climate learning beyond isolated lessons and enable learners to connect climate issues with existing learning and local sustainability contexts. For educators, this requires aligning learning objectives, content and assessment so that climate competencies develop progressively, rather than through disconnected lessons or activities.

Effective climate teaching uses engaging and varied approaches that go beyond simply delivering information. A key feature of climate teaching in this domain is actively involving students in learning. Evidence shows that engaging learners in participatory approaches such as asking questions and exploring ideas, learning by doing, and working on projects can help them engage more deeply with climate issues. Through real-world investigations, community-based projects and action-focused activities, educators can help students apply what they have learned, use evidence and think about possible responses to climate challenges. The use of digital tools, local data and different types of learning materials can further support this process and give students opportunities to explore and evaluate climate solutions.

Teaching climate change can be intellectually demanding and emotionally challenging, requiring educators to engage with uncertainty, urgency and ethical tension. Continuous professional learning, participation in professional networks and reflective practice are therefore essential for strengthening climate teaching expertise over time (ATECCE, 2024; UNU-IAS, 2025). In line with this, supporting educators' well-being and emotional resilience is not peripheral, but integral to sustaining high-quality climate pedagogy.

IN PRACTICE

Rather than adding a stand-alone climate lesson, climate pedagogies can be integrated into existing subject matters. For instance, a mathematics teacher might use local temperature or rainfall data to teach data interpretation, while a language teacher might analyse competing climate narratives. Learners can investigate questions, work collaboratively and help shape aspects of the learning process. Educators also need access to peer networks and professional learning so that climate pedagogy can develop over time.

Table 4: Core Competencies, Domain 2 (How to Teach)

<i>Domain</i>	<i>ID</i>	<i>Core Competencies</i>	<i>What it can look like in practice</i>
HOW TO TEACH		TEACHING PRACTICE IN PLACE	
	2.1	Climate curriculum integration	A concrete plan to integrate climate-related topics within the subject area is developed in accordance with policy standards.
	2.2	Engaged and innovative climate pedagogy	Inquiry-based, action-oriented activities that ask learners to analyse a climate-related issue and develop solutions in collaboration with peers and community members are incorporated.
	2.3	Learner-centred and participatory facilitation	Learning activities are designed so that learners collaboratively explore, investigate and discuss climate-related issues and co-design their learning experience.
	2.4	Professional growth and well-being	Participation in relevant professional learning opportunities and collaboration with peer networks.

4.3 Domain 3. How to Care for Learners: Social-Emotional and Relational Competence

WHAT IT MEANS

Domain 3 explores how educators care for learners in CCE. It recognizes that climate learning is not only cognitive, but also emotional and relational (Gilligan, 1982; Noddings, 1984). It positions care as ethics, a central professional responsibility for educators (Tronto, 1993) that shapes how learners experience, interpret and remain engaged with climate learning. Educators play a critical role in recognizing and responding to climate emotions in ways that validate learners' experiences and support emotional resilience. Thus, it is important to create supportive and caring learning environments in which learners feel safe to express ideas, questions and concerns.

In CCE, where issues can be deeply personal, caring facilitation is essential for enabling collaboration and mutual respect. Modelling hopeful and solution-oriented attitudes further supports learners in engaging with climate challenges without becoming immobilized by fear or despair. In this case, Domain 3 highlights fostering learners' sense of connection to themselves, to others and to the natural environment. Encouraging collaboration, mutual support and shared responsibility reinforces a sense of belonging and interdependence, which is foundational for collective climate action. The core competencies of this domain are summarized in Table 5.

WHY IT MATTERS

There is an increasing recognition of how the impacts of climate change, both direct and indirect, can negatively affect learners' mental health, inhibiting their ability to act (Hickman et al., 2021). Evidence shows that as awareness of climate change rises, many learners experience significant emotional responses, including eco-anxiety, grief, guilt and a sense of helplessness (Leger-Goodes et al., 2022; Ojala et al., 2021). Rather than minimizing or avoiding emotional responses, effective climate educators acknowledge that such reactions are understandable and provide learners with strategies for coping, reflection and sense-making. Creating space for emotional processing helps prevent disengagement and supports students' sustained participation in climate learning.

Climate issues can also be deeply personal and can be experienced differently across cultures, communities and individuals. Supportive and caring learning environments can encourage empathy, active listening and respect for different perspectives, while helping learners understand their relationships with other people, their communities and the natural environment. These connections can strengthen learners' sense of belonging, interdependence and care. Together, emotional awareness, supportive relationships and connection to self, others and nature provide an important foundation for meaningful engagement with climate learning and action. By attending to students' emotional experiences and relational connections, educators create conditions that support meaningful engagement with climate knowledge, pedagogy and action across the other domains of the framework.

IN PRACTICE

A learning activity might begin by asking learners to reflect on how a local environmental change affects their community and how they feel about it, with clear norms for respectful listening. Educators can include traditional and Indigenous knowledge where relevant and support learners to connect climate issues to their own identities and relationships without assuming that all learners experience climate change in the same way.

Table 5: Core Competencies, Domain 3 (How to Care for Learners)

<i>Domain</i>	<i>ID</i>	<i>Core Competencies</i>	<i>What it can look like in practice</i>
HOW TO CARE FOR LEARNERS			CARE AND VALUES FOSTERED
	3.1	Climate emotion and climate care-centredness	Structured opportunities for learners to reflect on and openly express feelings and thoughts about climate and environmental issues are created with particular attention paid to cultural and social contexts (e.g. traditions, values).
	3.2	Respect for diversity	Learning activities that encourage learners to consider different cultural, social or community perspectives on climate change, including traditional and Indigenous knowledge, are included.
	3.3	Connection to self and others	Exercises that ask learners to reflect on how climate change relates to their own lives, communities and identities are used.
	3.4	Connection to the natural world	Learning activities and exercises that include learners' observation, discussion and interaction with natural environments are incorporated.

4.4 Domain 4. How to Assess: Holistic Assessment

WHAT IT MEANS

Domain 4 responds to the need to move beyond testing what learners remember. It instead focuses on a comprehensive assessment of their understanding of climate change, their values and feelings in relation to it, and how they act on it in real life. In this domain, transformative assessment is an approach that brings together different ways of assessing learning. These may include checking understanding during lessons (not only at the end of the semester), using real-world tasks and asking students to reflect on their learning. Together, these approaches support meaningful learning and action. It also emphasizes designing assessments that take into account learners' needs and contexts, including identifying meaningful evidence of learning and giving feedback to support student development.

Domain 4 therefore supports assessment practices that are intentionally aligned with learning goals, focused on evidence of understanding, grounded in authentic performance and supported by formative feedback that advances learning over time. Assessment is recognized as an integral part of climate change education rather than a final checkpoint. Assessment for climate learning and action thus reinforces coherence across the framework, connecting knowledge, care, futures thinking and participation in ways that support deep understanding and transformative engagement. The core competencies of this domain are summarized in Table 6.

WHY IT MATTERS

A core element of Domain 4 is identifying evidence of learners' understanding and designing real-world tasks that allow students to apply their learning. Educators should begin by clarifying what counts as acceptable evidence of climate understanding and competence. This includes evidence such as explanations of climate processes, systems models, ethical reasoning and the ability to apply learning to unfamiliar or real-world contexts. Educators then design authentic performance tasks such as investigations, design projects, simulations or community-based actions. These tasks allow learners to demonstrate transfer of learning rather than rote knowledge. Clear criteria and rubrics help make expectations transparent and enable both educators and learners to evaluate progress toward desired climate competencies.

Domain 4 also highlights the importance of students thinking about their own learning and being involved in the assessment process. Assessment in CCE is not only evaluative but developmental. Educators support learners in reflecting on what they have learned about climate systems, how their values and emotions influence decision-making, and how their actions align with personal and collective goals. Through reflection, self-assessment and feedback from peers, students become more aware of their learning and take greater responsibility for it. When these practices are built into ongoing learning activities, students begin to see assessment as a way to improve and grow, rather than as a final check.

A further dimension of Domain 4 is ensuring that assessment is fair and responsive to context. Climate learning is shaped by local environments, cultural backgrounds and different ways of

understanding the world. Educators therefore should use a range of assessment approaches to capture students’ understanding, skills, values and participation in action, rather than relying on a single method. These approaches take into account students’ backgrounds, recognize different perspectives and aim to ensure fairness in how learning is assessed. By making expectations clear and adapting tasks to the local context, educators create opportunities for all students to show what they know and contribute meaningfully.

IN PRACTICE

Instead of asking learners to define climate adaptation, an educator might ask them to identify and analyse a local climate risk and propose an adaptation measure. Providing learners with clear criteria can help them focus their assignments on the accuracy of the explanation, quality of evidence, relevance to local context and community engagement, and feasibility of the proposed response. Feedback from community members, the educator, peers and self-assessment can then be used to improve the work.

Table 6: Core Competencies, Domain 4 (How to Assess)

<i>Domain</i>	<i>ID</i>	<i>Core Competencies</i>	<i>What it can look like in practice</i>
HOW TO ASSESS			PROGRESS TRACKED
	4.1	Evidence of understanding	Assessment that measures learners’ conceptual understanding of a climate-related issue, reasoning quality and evidence used is administered.
	4.2	Authentic performance	Assessment carried out through real-world tasks, such as developing solutions to real-world climate-related local challenges.
	4.3	Formative feedback that advances learning over time	Learners are supported through actionable, constructive feedback, including self- and peer assessment, that focuses on improving analyses of climate change impact and/or developed solutions.

4.5 Domain 5. How to Support Action: Participation and Agency Building

WHAT IT MEANS

Domain 5 envisions agency building as the ultimate learning outcome of learners when it comes to preparing them for climate action. This domain incorporates three dimensions of climate action: i) fostering learners' individual behaviours, through promoting ethical and responsible decision-making; ii) building meaningful connections with community members to facilitate students' involvement in collective action and iii) building students' action readiness and problem-solving skills, to encourage active civic engagement for systems change.

Domain 5 centres on how educators support learners in translating climate understanding, care and future visions into meaningful participation, action and agency building. CCE ultimately aims not only to raise awareness, but to empower learners to engage constructively with real-world challenges in ways that are informed, responsible and context-sensitive. However, it is important to emphasize that Domain 5 frames action not as a single outcome, but as an ongoing learning process rooted in participation, collaboration and ethical reflection in individual, collective and civic dimensions. By preparing learners to engage thoughtfully and responsibly with climate challenges, educators help bridge the gap between knowledge and practice. The core competencies of this domain are summarized in Table 7.

WHY IT MATTERS

Effective climate action requires learners to move beyond awareness and concern toward informed and meaningful action grounded in an understanding of real-world conditions. This includes considering the feasibility, risks and trade-offs associated with different courses of action, recognizing that climate solutions often involve uncertainty and competing priorities. Strengthening learners' confidence and sense of efficacy can help prevent feelings of helplessness and support sustained engagement with climate action and elevate them into collective actions.

Climate action is also inherently collective and socially embedded. Educators enable learners to participate meaningfully by creating opportunities to work with peers, schools and community partners, including local organizations, practitioners and knowledge holders. Through collaborative projects such as awareness campaigns, audits, service-learning initiatives or community-based problem solving, learners experience how collective action can address shared challenges. Educators support this process by cultivating skills such as dialogue, shared decision-making, negotiation and collective problem solving, while also helping learners navigate power dynamics, diverse perspectives and real-world constraints.

Such experiences strengthen learners' understanding of citizenship, participation and the social dimensions of sustainability transitions, and eventually their sense of agency and purpose. Educators play a critical role in supporting students to see themselves as capable contributors to long-term change. By linking present choices and actions to future

consequences, educators help learners understand how individual, collective and civic actions can influence environmental and social trajectories over time.

Strong school–community linkages can help extend climate action beyond the classroom by connecting learners and educators with local knowledge, partners and opportunities for collective action. Ongoing peer collaboration, communities of practice and mentorship can also help educators exchange experiences and sustain confidence in supporting such engagement over time.

IN PRACTICE

Learners might identify a sustainability challenge in their school or community, consult with relevant stakeholders and develop a realistic proposal for solutions. The educator can help them distinguish between symbolic and meaningful action, examine who benefits or may be affected, consider practical constraints, and reflect on what they would change after receiving feedback from peers, communities and other stakeholders, or seeing the results of an initial action.

Table 7: Core Competencies, Domain 5 (How to Support Action)

<i>Domain</i>	<i>ID</i>	<i>Core Competencies</i>	<i>What it can look like in practice</i>
HOW TO SUPPORT ACTION			ACTIONS INITIATED
	5.1	Responsible and ethical decision-making and individual action	Responsible and ethical climate-related practice is identified and actively practiced by learners and modelled by educators within classrooms, schools or learning environments (e.g. waste sorting system, responsible materials use).
	5.2	Collaboration and community participation for collective action	Structured and continuous opportunities for learners to meaningfully interact with school actors, families and community stakeholders on sustainability issues and local initiatives are established.
	5.3	Learners' civic engagement and solution-orientedness	A simple action plan or proposal to institutions and decision makers, including community leaders, policymakers and industries, for addressing a local sustainability issue is developed by learners.

Chapter V – Conclusion and Ways Forward

The C³FE framework presents three key implications:

First, it defines five essential core domains synthesized from an extensive and critical review of 20 internationally acclaimed CCE frameworks. While existing frameworks often feature varying or undefined structures, the C³FE offers a systematic, comprehensive and actionable one-stop framework. However, the framework is intentionally designed as a foundation rather than a complete guidance for implementation. Future work can support the contextualization and application of C³FE through classroom-ready guidance, examples, educator-learning resources and evidence on how the framework is used across different settings.

Second, the framework lays a vital foundation for developing teacher training policies, programmes and resources, namely, the building blocks for key performance indicators (KPIs) and diagnostic tools to measure teacher readiness in CCE. This package of resources will equip teacher training authorities and ministries of education with the necessary tools for data-driven policy decisions. Future indicators and assessment development can build on the framework as evidence accumulates from its use in practice. Professional learning should be accompanied by ongoing support. Climate change is a rapidly evolving and emotionally demanding field, and educators benefit from opportunities to collaborate with peers, access updated resources, reflect on practice, and connect with relevant community and technical expertise. Sustained support is therefore likely to be more useful than isolated professional development activities.

Finally, recognizing that climate change impacts are rooted in local realities, the framework is designed to be highly adaptable to various national contexts and educational settings. Training modules can be customized based on the initial readiness levels of the target educators, allowing for the prioritization (or de-prioritization) of specific domains and modules. As climate science, policy, education practice and local priorities evolve, the framework should be treated as a living reference that can be refined without losing its core purpose: helping educators translate climate knowledge, care, pedagogy, assessment and action into meaningful learning.

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Annex

Table 8: List of CCE Frameworks included in the analysis

Geographic scope		Organization	Round 1 (Count)	Round 2 (Count)
Global		Greening Curriculum Guidance - Teaching and Learning for Climate Action (UNESCO, 2024a)	1	1
		Teaching Climate Change: From Knowledge to Action (UNESCO, 2025)	1	-
		Education for Climate Action (Education Commission, 2022)	1	-
		Adaptation and Climate Resilience in Schools (GCA, CEE, FEE (2022)	1	-
		Choosing Our Future: Education for Climate Action (World Bank, 2024)	1	1
		Skills for a Green Transition: Solutions for Youth on the Move (UNICEF, ILO, World Bank, 2024)	1	1
		Toward Climate-Smart Education Systems (GPE, 2023)	1	-
		Action for Climate Empowerment (UNESCO and UNFCCC, 2016)	1	-
		A New Green Learning Agenda - Approached to Quality Education for Climate Action (Brookings Institute, 2021)	1	1
		Action-oriented pedagogies for education for sustainable development and climate action (UNU-IAS, 2025)	-	1
		Empowering Young People Through Climate Literacy (OECD, 2024)	1	1
		Empowered Citizens, Informed Consumers and Skilled Workers (OECD, 2025)	1	-
		Are Students Ready to Take on Environmental Challenges? (OECD, 2022)	-	-
		Subtotal	11	6
	Regional	Europe	GreenComp The European Sustainability Competence Framework (European Commission, 2022)	1
Competence Framework for Transformative Climate Resilience Education for Children and Youth (CLARITY, 2025)			1	1
Asia		Climate Change and Education Playbook (ADB, 2024)	1	1
		The Asian Framework of Teacher Education for Climate Action (ATECCE, UNESCO and JSPS, 2024)	1	1
		Climate Education Toolkit for Educators and Their Unions (EIAP, 2021)	1	1
		SEAMEO Strategic Plan 2021-2030 (SEAMEO, 2021)	1	-
Africa		Africa Environmental Education and Training Action Plan (AEETAP) 2015–2024 (UNEP, 2017)	1	1
		Methodologies for the Future- A Guide to Develop Education for Sustainable Development (WWF, 2012)	1	1
Latin America		Environmental Education Resource Guide (UNEP, 2023)	1	1
		Subtotal	9	8
Total			20	14

