

An integrated framework for climate change education planning, policy, and practice: Insights from Central Asia

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ABSTRACT

Climate change education (CCE) is increasingly seen as a crucial strategy for equipping present and future generations with the knowledge, skills and resources to respond to the accelerating impacts of climate change. However, the integration of CCE within national and sub-national education systems remains slow, uneven and fragmented. Efforts to better guide national efforts at implementing CCE have led to multiple analytical frameworks and guides, each with different scales and domains of focus, but integrated guidance that addresses CCE planning, policy and practice is lacking. This study proposes and pilots an analytical framework to assess how CCE is positioned across governance levels and translated from policy into practice in four Central Asian countries: Kazakhstan, Kyrgyzstan, Tajikistan, and Uzbekistan. The holistic assessment of policy, system delivery, school-level implementation, and equity domains is used to identify critical gaps and highlight key entry points for aligning CCE with national climate priorities, strengthening its role in promoting a comprehensive and transformative education system for climate resilience.

Keywords: climate change education, Central Asia, education policy, analytical framework, planning, policy, practice

INTRODUCTION

Climate change is widely recognized as a significant threat to national development, threatening the stability of ecosystems, economies, and societies worldwide, particularly for low- and middle-income countries where vulnerable communities are disproportionately affected (Intergovernmental Panel on Climate Change [IPCC], 2023). As the impacts of climate change intensify, the role of climate change education (CCE) in building resilience and equipping populations to mitigate and adapt to these challenges has gained increasing recognition (Aeschbach et al., 2025; Mochizuki & Bryan, 2015). Across international agendas, academic research, and policy discourses, CCE is seen as a critical tool for fostering awareness, enhancing adaptive capacities, and empowering communities, especially vulnerable ones, to take informed action in response to the climate crisis (Aeschbach et al., 2025; UNESCO, 2015; Wals & Benavot, 2017). Meanwhile, growing evidence has shown that climate change is already disrupting education systems and affecting learners' well-being and access to schooling, impacting as many as one in seven students globally (UNICEF, 2024), which further reinforces the need for education system

to play a more active role in climate responses (Prentice et al., 2024).

Despite this growing recognition, the education sector remains underutilized as a strategic resource for climate action (Mochizuki & Bryan, 2015). Although many countries have incorporated references to CCE in national policies, these commitments often lack coherence, operational clarity, and sustained system-level support (Læssøe & Mochizuki, 2015; UNESCO & MECCE, 2024). In many cases, CCE is frequently framed around isolated content knowledge that can contribute to awareness-raising among learners rather than as a cross-cutting component of education systems requiring alignment across planning, financing, curriculum, teacher development, and monitoring. Recent studies also report that in many education systems CCE is impacted by limited collaboration across ministries, sectors, and governance levels, as well as weak coordination with external support from international partners (Global Partnership for Education [GPE], 2023b; UNESCO & MECCE, 2024). Concerns about the quality and effectiveness of CCE further reflect these gaps. A UNESCO and MECCE (2023) survey found that 70% of 17,000 young people across 163 countries expressed concerns about the standards and effectiveness of CCE. These trends suggest that the

challenge is not only expanding CCE, but understanding how it is embedded, coordinated, and enacted within education systems.

Efforts to guide and evaluate CCE have led to the development of multiple international frameworks. These frameworks offer valuable insights into specific dimensions such as policy ambition, school practices, or cognitive competencies. However, they tend to operate at different scales and are not designed to be used together; this fragmentation limits our ability to understand how different components of education systems interact, making it difficult to identify where and why gaps persist. As a result, it remains difficult to assess how CCE is embedded system-wide and how policy commitments translate into educational practice and system capacity in a consistent and coordinated way.

Recognizing this gap, this study develops an integrated CCE analytical framework for planning, policy, and practice (CCE-PPP), which brings together insights from existing international approaches and organizes them into a multi-level structure that captures national policy and planning, education-sector delivery, school-level practice, and cross-cutting equity considerations. It is designed both as an analytical tool for assessing CCE and as a practical framework for supporting more coherent planning and implementation.

The CCE-PPP framework is piloted in an evaluation project on CCE in four Central Asian countries: Kazakhstan, Kyrgyzstan, Tajikistan, and Uzbekistan. These countries provide a relevant context given the increasing climate risks in the region, including extreme weather events, water scarcity, and glacial melt, which intersect with ongoing social and economic transitions (Fallah et al., 2024; Green Central Asia, 2023; IPCC, 2023). Therefore, the need for effective national strategies, greater regional cooperation and strengthened human and institutional capacities are becoming ever more pressing. Although countries in the region have made commitments to climate action, the integration of CCE into education systems remains uneven and fragmented, often shaped by overlapping international frameworks, limited institutional capacity, and evolving governance arrangements (Gong et al., 2024). In this context, there is a need not only for stronger policy commitments, but for analytic tools that can support a more systematic understanding of how CCE is positioned and implemented and where opportunities for transformation lie.

Given this context, this study is guided by three research questions:

- (1) How can CCE policy and practice be assessed more holistically through an integrated framework;
- (2) What does the application of such an assessment reveal about the current state of CCE in Central Asia; and
- (3) What opportunities for transforming CCE policy and practice emerge from this analysis.

The findings show that CCE remains unevenly institutionalized in the Central Asian context, characterized by persistent gaps between policy ambition, system capacity, and implementation. The analysis based on the framework also helps identify entry points for improving policy coherence, strengthening education system capacity, and integrating equity considerations more effectively. The pilot

application of the CCE-PPP framework demonstrates its analytical and practical value in supporting more coherence and context-sensitive CCE in the region, it also offers a transferrable approach for advancing climate action and fostering collaborative partnerships across broader contexts.

CLIMATE CHANGE EDUCATION IN POLICY AND PRACTICE: A REVIEW OF KEY APPROACHES

Originally termed by UNFCCC in 1992, CCE encompasses a range of educational strategies aimed at informing and empowering individuals about climate change, its impacts, and actions needed to respond to it (Monroe et al., 2019; Stevenson et al., 2017). Evolving from traditional environmental education (EE), CCE takes a more holistic approach by integrating scientific knowledge, social justice, equity, and intersectionality (Stevenson et al., 2017). It is intended to extend traditional educational approaches by not only promoting awareness of environmental issues but also addressing the anthropogenic activities and social-ecological processes that influence people's understanding of climate change (Brownlee et al., 2013). This shift can enable more effective educational strategies that empower individuals and communities to engage meaningfully with climate challenges and foster a more holistic approach to stimulate the systemic changes needed to achieve sustainability (Chang, 2023; UNESCO, 2010).

CCE is also intrinsically linked to the broader framework of Education for Sustainable Development (ESD). ESD aims to equip learners with the knowledge, skills, values, and attitudes needed to create sustainable futures, emphasizing the interconnectedness of environmental, social, and economic issues (UNESCO, 2020). CCE complements this by providing a focused lens on climate change, addressing how it intersects with ethical and social concerns that arise in a world where climate change disproportionately affects marginalized communities (Islam & Winkel, 2017; Lohani et al., 2025). Therefore, CCE must be context-specific, adapting to local socio-economic, cultural, and environmental conditions to be effective (Mochizuki & Bryan, 2015).

In practice, however, this shift towards more holistic CCE has been slow to materialize. From a pedagogical perspective, a UNESCO study found that references to socio-emotional learning only appear in 7% of formal education submissions to the UNFCCC and references to behavioural learning only featuring in 27% of curricula (UNESCO & MECCE, 2024). These gaps risk perpetuating an "information-deficit" model of CCE, where students merely acquire facts without questioning the underlying drivers of climate change or considering transformative solutions (Leichenko et al., 2022). To overcome these limitations, Leite (2024) calls for more transformative CCE pedagogies that move beyond content-based education to include approaches that foster critical thinking, collaboration, and action-oriented learning.

From the perspective of global governance, the need for a more holistic and transformative approach is also reflected in the rise of evaluation frameworks promoted by multilateral

agencies. These frameworks have sought to assess the effectiveness, inclusivity, and impact of CCE initiatives, mostly focusing on national policy making and school-based preparedness. The UNFCCC, for instance, tracks education commitments through indicators like policy ambition, inclusion, and climate justice (Kwauk, 2022). UNESCO advocates taking a “whole-of-school” approach to evaluating school governance, pedagogy, infrastructure, and community engagement (Gibb, 2016). GPE (2023a) advocates for climate-smart education systems through evidence-based policies and planning, cross-sector coordination, finance access, climate data and evidence, infrastructure and school safety, and curricula, pedagogy and teacher training. Although these frameworks provide valuable insights into specific dimensions of CCE, they tend to prioritize distinct entry points and thus offer limited guidance for understanding how these dimensions interact across governance levels or how policy commitments are translated into practice.

From a national policy perspective, calls for increased emphasis on CCE from a wide range of global bodies, as well as from young people themselves (Karsgaard & Davidson, 2023), have led to a near-universal adoption of national policies and plans to address climate change in primary and secondary education (UNESCO & MECCE, 2023). However, the ambition, integration, quality, and degree of institutional readiness underpinning most of these national policies remains insufficient, even in comparatively well-resourced educational systems such as those in Europe and Canada (Kwauk, 2022; UNESCO & MECCE, 2024). The extent of this integration also varies dramatically from country to country with many of the most vulnerable countries, such as Small Island Developing States leading the way in terms of comprehensive policies (UNESCO & MECCE, 2024). Additionally, in some contexts, the adoption of CCE and ESD policies and plans aligned with the guidance of intergovernmental agencies like UNESCO appears to be primarily symbolic and reflective of countries’ strategic multilateral objectives and global power dynamics (Berryman & Sauv  , 2016), rather than a meaningful commitment to changing national educational practices. This can lead to cynicism about the real value and ownership of these policies.

Current evidence points to an increasingly widespread advocacy for, and reference to CCE in policy and practice in a more coherent way across different levels, but significant concerns remain about the depth, effectiveness, coordination, and commitment behind these efforts, with considerable variation across regions (UNESCO & MECCE, 2023). In response, this study develops an integrated analytic framework to examine how CCE is embedded from national strategic planning to educational policies and cross-level practice. The framework is applied through a pilot analysis of four Central Asian countries. The following section outlines the methodological approach used to operationalize this framework, assess CCE integration, and identify opportunities for transforming policy and practice.

METHODOLOGICAL AND ANALYTICAL APPROACH

This study adopts a qualitative research approach to develop and apply an integrated analytical framework for assessing CCE. It is structured in two linked components: first, the development of the CCE-PPP framework based on existing international frameworks; second, its pilot application in four Central Asian countries to examine how CCE is positioned and implemented across different governance levels. The study is guided by three research questions: (1) How can national CCE policy and practice be assessed more holistically through an integrated framework? Building on the results of RQ1, the next question focuses on applying this framework through a regional assessment, asking: (2) What does the application of this framework reveal about the current state of CCE policy and practice in the Central Asian region? And finally, the study explores implications for transformation by asking: (3) What opportunities for transforming CCE policy and practice emerge from this holistic assessment? To answer the research questions, the study followed a three-step analytical process, including the development of a new analytical framework, document analysis, and semi-structured interviews.

Development of the Analytical Framework

In the first step, we reviewed existing international frameworks on CCE and related education system responses. These included, *climate-smart education systems framework* (GPE, 2023a), *getting climate-ready: a guide for schools on climate action* (Gibb, 2016), *the CCE ambition report card* (Kwauk, 2022), and *action for climate empowerment* (UNESCO & UNFCCC, 2016). These frameworks emphasize complementary but distinct aspects of CCE, ranging from policy ambition and system strengthening to whole-school approaches, coordination, and climate justice. The key dimensions identified across these frameworks are summarized in **Table 1**.

Although these frameworks offer valuable lenses on specific elements of CCE, they tend to prioritize particular entry points, and if taken individually, they do not provide a sufficiently integrated structure for assessing how CCE is embedded across governance levels, nor how policy intent translates into educational practice and system capacity. To address this limitation, common themes and gaps were extracted across frameworks and synthesized into a more comprehensive analytical structure.

The resulting framework, referred to in this study as the CCE-PPP, was designed and organized across four interrelated domains: **national-level policy and planning, education-sector delivery, school-level coordination and practice, and cross-cutting equity and inclusion considerations**. This structure aimed to capture both vertical alignment across governance levels and horizontal linkages between policy commitment, financing, implementation, and learning processes. Although the framework was defined prior to empirical analysis, its indicators and key areas were refined iteratively as it was applied to the Central Asian context, ensuring contextual relevance without altering the core analytical structure.

Table 1. Key dimensions for CCE evaluation identified in existing frameworks

Existing framework	Key dimensions
Toward climate-smart education systems: A 7-dimension framework for action	1. Data and evidence 2. Policy and planning 3. Coordination 4. Finance 5. Infrastructure 6. Teaching and learning 7. Schools and communities
The CCE ambition report card	1. Policy ambition 2. Pervasiveness (extent of integration) 3. Inclusion (of key and relevant stakeholders) 4. Quality of CCE 5. Climate justice 6. System strengthening
Getting climate-ready: A guide for schools on climate action	1. Planning: A whole-school approach 2. Action a. School governance b. Teaching and learning c. Facilities and operations d. Community partnerships 3. Monitoring
Action for climate empowerment	1. Initiation a. Coordination b. Conceptual base c. Existing national policies and plans d. Monitoring and evaluation plan 2. Planning a. Needs and delivery capacities b. Strategic plan c. Stakeholder consultations 3. Implementation a. Cross-sector partnerships b. Financial & technical resource mobilization 4. Monitoring, evaluation and reporting

Table 2 presents an overview of the CCE-PPP framework, outlining the framework's levels, dimensions, and key analytical themes.

Document Analysis

The second step involved using this new framework to analyze national-level policy and strategy documents retrieved from government repositories, official legal databases, and national submissions to UNFCCC. Reports from multilateral partners such as UNESCO, the World Bank and the United Nations Economic Commission for Europe were also included when relevant.

Document selection followed three criteria:

- (1) explicitly reference climate change, environmental sustainability or disaster risk management;
- (2) relevance to education sector planning, teacher development, and school management in response to climate challenges; and
- (3) alignment with international frameworks such as the UNFCCC national communications and nationally determined contributions (NDCs), education sector plans, and national sustainable development goal implementation strategies.

A total of 38 documents published in English and Russian between 2013 and 2024 were reviewed. A full list of the national documents assessed can be found in **Appendix A**. All documents were coded deductively using the CCE-PPP framework, which guided the analysis and ensured consistent interpretation across countries. Coding focused on identifying the presence, scope, and operationalization of CCE across policy domains.

Semi-Structured Interviews

In addition to document analysis, semi-structured interviews were conducted with 15 key stakeholders from Kazakhstan, the Kyrgyz Republic, Tajikistan, Uzbekistan, and one regional organization. Most interviews were conducted individually, aside from two small group interviews. Participants represented a range of stakeholder groups involved in CCE, including government and Ministry of Education officials, teachers, university leadership, civil society and environmental organizations, international development agencies, and regional youth climate networks. This diversity of perspectives enabled the study to capture experiences and insights from policy, education, civil society, international partner, and youth engagement contexts across Central Asia.

The interview guide was developed based on the CCE-PPP framework and piloted informally with regional partners to ensure clarity and relevance. Interviews were conducted between 2023 and 2024, in either Russian or English, and lasted approximately 45-60 minutes. All participants provided informed consent, and ethical approval was obtained through the institutional procedures governing the UNESCO-commissioned study. To protect confidentiality, interview excerpts are cited using professional role descriptors rather than personal identifiers.

Data Synthesis and Triangulation

In the third step, findings from the document analysis and interviews were triangulated through thematic comparison. Interview data were analyzed thematically according to the CCE-PPP framework and then compared with the document analysis to identify areas of convergence and complementarity. This triangulation process strengthened the analytical robustness of the study by ensuring that the analysis drew on both formal policy commitments and stakeholder perspectives on implementation. This process also revealed seven emerging themes:

- (1) lack of unified terminology and unclear conceptual framing of CCE,
- (2) gaps between policy ambition and implementation,
- (3) institutional communication and coordination barriers,
- (4) the under recognized role of civil society leadership and community-based CCE initiatives,
- (5) the lack of culturally relevant and locally grounded teaching and learning resources,
- (6) the lack of youth leadership in CCE planning and decision making, and
- (7) climate related migration and social vulnerability.

Table 2. Analytical framework for planning, policy, and practice (CCE-PPP) (based on the frameworks outlined in Table 1)

Level	Dimension	Key themes
National	Policy commitment to CCE	• CCE in national policies/visions/strategies • CCE in educational planning • Country's engagement with global frameworks relevant to CCE
	CCE financing	• Definition of climate-related financing in education budgets and education-related financing (if any) • Financing mechanisms
	National planning, monitoring, & evaluation	• Source of data/evidence to inform (a) CCE and (b) assessing the impacts of climate change on children, communities and schools • Management of data • Monitoring and evaluation
	Inter-sectoral coordination	• Coordination with authorities responsible for climate change, environment and disaster management • Role assigned to the Ministry of Education • Collaboration with other relevant ministries and initiatives
Education sector	Education infrastructure	• National provisions for climate-resilient education infrastructure • School-level physical environment for CCE learning
	Teaching and learning	• Teacher development (pre- and in-service) • Learning and curriculum (including content, learning approaches, assessment, and wellness)
	Capacity building	• Cooperation that supports capacity building • Capacity building approaches (including role of research and plans of public awareness-raising)
School	School level planning and coordination	• School-level disaster management plans • Partnerships to engage in climate change, disaster risk and environmental action • Equity concerns for women, children and marginalized groups in school level planning and coordination efforts
Cross-cutting	Equity & inclusion	• Recognition of and ways to address specific needs and climate-related vulnerabilities • Decision-making process in including voices from women, youth, children and indigenous communities • Approaches to promote diversity, equity, and inclusion of cultures, knowledge, epistemologies, and other ways of knowing and being

These themes were then mapped into the existing dimensions of the CCE-PPP framework and used to refine the framework's indicators by incorporating additional nuances to reflect the key challenges and opportunities identified across the two datasets (**Appendix B** provides a detailed description of the indicators underpinning each dimension).

The integration of seven emerging themes and the rationales are summarized as follows:

"Lack of unified terminology and unclear conceptual framing of CCE", together with "gaps between policy ambition and implementation", were integrated into the "policy commitment to CCE" dimension. These themes relate to the extent to which CCE is supported by coherent policy visions, clearly articulated objectives, and implementation mechanisms, making them central expressions of policy commitment.

"Institutional communication and coordination barriers" were integrated into the "inter sectoral coordination" dimension because they reflect the effectiveness of collaboration and information sharing across ministries, sectors, and levels of governance, which are fundamental aspects of coordinated CCE planning and implementation.

"The under recognized role of civil society leadership and community-based CCE initiatives" was integrated into the "capacity building" dimension because these initiatives represent important sources of knowledge, expertise, partnerships, and learning opportunities that strengthen the capacity of education systems to deliver CCE.

"The lack of culturally relevant and locally grounded teaching and learning resources" was integrated into the "teaching and learning" dimension because it directly relates to the design, content, and delivery of CCE, particularly the

extent to which learning materials support effective teaching in diverse educational contexts.

"The lack of youth leadership in CCE planning and decision making", as well as "climate related migration and social vulnerability", were integrated into the "equity and inclusion" dimension because both themes concern whose perspectives, needs, and lived experiences are represented in CCE policies and practices, particularly those of groups facing structural barriers or disproportionate climate impacts.

Coding Summary

Following the synthesis and integration of emerging themes, a codebook was developed to capture the frequency of coded references identified under each framework dimension (see **Table 3**).

For the document analysis, one coded reference represents a relevant evidence entry extracted from the national policy documents. For the interviews, one coded reference represents a relevant interview excerpt or quotation assigned to a framework dimension. These frequencies indicate the relative prominence of different themes within the qualitative dataset and help illustrate where policy documents and stakeholder perspectives most frequently converged, diverged, or complemented one another.

However, higher coding frequencies should not be interpreted as measures of the extent or effectiveness of CCE efforts within a particular dimension. Instead, they reflect the degree to which a topic emerged during the analysis, which may indicate areas of active policy attention, persistent challenges, or recurring concerns raised by participants.

Table 3. CCE-PPP codebook with document, interview, and emerging theme frequency summary (based on coding process of document analysis and interviews)

Level	Dimension	Coded references from document analysis	Coded references from interview excerpts
National	Policy commitment to CCE	27	17
	CCE financing	12	11
	National planning, monitoring & evaluation	12	5
	Inter-sectoral coordination	11	2
Education sector	Education infrastructure	9	2
	Teaching and learning	17	23
	Capacity building	19	19
School	School level planning and coordination	9	22
Cross-cutting	Equity & inclusion	15	25

Table 4. A summary of CCE in planning, policy, and practice in Central Asia (based on findings from national document analysis and interviews)

Country	Global commitments and national strategies	CCE in educational planning	CCE in practice
Kazakhstan	- Committed to transitioning to a “green economy” by 2030 - Focuses on energy efficiency and ecological culture - Aims for carbon neutrality by 2060. - Policies emphasize inclusion but lack systematic measures for vulnerable groups	- Unequal access to inclusive education infrastructure - Insufficient government financing and data for monitoring CCE effectiveness	- CCE in formal education faces challenges in curriculum and teacher development - CCE in non-formal is more effective but requires sustained institutional and financial support - Young leaders and grassroots initiatives play a critical role
Kyrgyz Republic	- Prioritizes competitive digital economy for green growth - Gender equality, Indigenous knowledge, and community safety are emphasized. - Inconsistent strategies hinder effective climate action	- CCE integrated as part of EE or ESD in educational planning since 2005 - Challenges include resource shortages, marginalization of sustainability topics, and lack of comprehensive monitoring	- Efforts made to improve education infrastructure and integrate CCE into curricula - Collaboration with NGOs and international partners is vital - Public awareness campaigns are ongoing but media coverage is limited
Tajikistan	- Prioritizes climate change adaptation in energy, water, agriculture, and transportation - Climate change issues integrated mainly into disaster risk management and agriculture policies - Particular equity concerns for women, youth and rural population	- Lack of clarity in how inclusive education and climate-related issues are connected in political decision-making processes - Lack of explicit mention of CCE - Absence of a consolidated monitoring and evaluation system for CCE	- Collaborations between universities and development partners to foster green innovations - Scarcity of specialized teachers and the use of outdated textbooks - Limited public participation and weak coordination - Donor influence drives surface-level policy activity
Uzbekistan	- The Ministry of Ecology, Environment and Climate Change coordinates national climate initiatives - Environmental and climate education are among national development goals - Emphasizes equity and inclusion, with efforts for children with special needs	- CCE integrated into environmental education overseen by the Ministry of Education - Lack of specific policies for CCE and limited financing - Monitoring mainly overseen by environmental ministries	- Progress shown in integrating CCE into secondary and university curricula. - The Central Asian Green University as a standout model - Major gaps remain in accessible materials and institutional coordination

RESULTS

This section presents findings from piloting the CCE-PPP framework across four Central Asia countries, Kazakhstan, the Kyrgyz Republic, Tajikistan, and Uzbekistan.

Table 4 presents a general summary of how CCE is addressed in global commitments, educational planning, and practice in these four countries, illustrating an uneven alignment between policy ambition, system capacity, and implementation. The analysis below presents the pilot application of the CCE-PPP framework, with the findings organized around its analytical levels to facilitate systematic cross-country comparison. This application illustrates the framework’s analytical value in identifying patterns, gaps, and misalignments across different levels of CCE governance.

National Policy Commitment, Financing, and Practice

At the national level, all four countries frame climate change as a strategic environmental and development concern. However, when assessed against CCE-PPP indicators for policy commitment, financing, and monitoring, CCE remains weakly institutionalized within national governance frameworks.

Analysis of national policy documents indicates that only a limited number of national strategies explicitly link education to climate change, occurring primarily in NDCs and environmental policy (see Government of the Kyrgyz Republic, 2021a; Government of the Republic of Kazakhstan, 2023; Government of the Republic of Tajikistan, 2021; Government of the Republic of Uzbekistan, 2021). Among the documents that do reference education, policy objectives tend to

emphasize awareness-raising or public information. More strategic commitments such as curriculum reform, structured teacher preparation, or the development of learner competencies are less articulated. For example, Kyrgyzstan's first NDCs outlines intentions to integrate environmental and climate-related issues into the education system (Government of the Kyrgyz Republic, 2021c), yet subsequent education strategies provide limited guidance on implementation (Government of the Kyrgyz Republic, 2021b). In Tajikistan, climate change is primarily addressed through disaster risk management and sectoral adaptation policies, with education referenced as a cross-cutting sector (Government of the Republic of Tajikistan, 2019). Kazakhstan and Uzbekistan similarly frame education as part of broader efforts to cultivate "ecological culture" or environmental responsibility, without adopting standalone national strategies dedicated to CCE (Government of the Republic of Kazakhstan, 2021; Government of the Republic of Uzbekistan, 2019).

Interview data align with this documentary finding. Respondents across all four countries described ambiguity regarding institutional responsibility for CCE and noted that education ministries are rarely positioned as lead actors within national climate governance structures. Interviewees in Tajikistan also emphasized the centralized nature of climate governance and the limited space for education-sector leadership. In Kazakhstan and Uzbekistan, respondents noted that climate-related education initiatives are often driven by project-based environmental programs or international donors rather than embedded within education system planning. A regional youth respondent summarized this problem as a communication gap, stating that cooperation with state-linked bodies, including schools and universities, had been the "weakest" form of interaction because of rigid procedures and limited long-term vision. These testimonies suggest that gaps in CCE integration are rooted in governance structures rather than in isolated implementation challenges.

This limited institutionalization is also reflected in national financing and monitoring arrangements. Among the reviewed national budgets and strategies, no explicit or dedicated financing mechanisms for CCE were found. Where climate-related education expenditures could be traced, they were generally embedded within project-based environmental initiatives or programs funded by international donors (Asian Development Bank, 2023; United Nations Development Program [UNDP], 2022; World Bank, 2023). In the NDCs of the four countries, environmental and economic indicators were prioritized in their national monitoring frameworks, with limited evidence of systematic tracking of education-related climate outcomes. An interviewee from the Kyrgyz Republic government stated directly that there was "no national M&E system" for CCE, emphasizing that this lack of education-linked indicators weakens the accountability of the education sector and reduces opportunities for CCE learning.

These findings suggest that although climate change is recognized as a national priority, weak policy integration, financing, and accountability mechanisms continue to constrain the institutionalization of CCE.

Education Sector Capacity, Teaching, and Learning

The effectiveness of national CCE policies ultimately depends on the capacity of education systems to translate policy commitments into curriculum, teacher preparation, and learning resources. At the level of the education sector, the analysis based on the CCE-PPP framework points to partial and uneven integration of CCE within curriculum frameworks, teacher development systems, and broader capacity-building efforts.

Across the reviewed education-sector documents, climate-related themes are more often treated as subject content within natural science, geography, or disaster risk reduction (Rozhdestvenskaya & Korotenko, 2021; Zhilbaev et al., 2022). On the other hand, the study found limited or inconsistent references to interdisciplinary learning, socio-emotional dimensions, or action-oriented pedagogies, a gap that interviewees also noted. Only a small subset of documents explicitly addresses teacher preparation or professional development in relation to climate change, and even fewer specify how teachers are expected to translate climate concepts into classroom practice. One exception is the Kyrgyz Republic, where education action plans include measures to support climate change education through teacher training, curriculum development, and teaching materials (Government of the Kyrgyz Republic, 2013, 2021a). However, similar provisions are largely absent from national teacher standards and professional development frameworks in Kazakhstan, Uzbekistan, and Tajikistan. A Kazakhstani teacher described teacher preparation as a first-order challenge, noting that "training is needed at all levels and for all specialities" when climate issues are added to school practice.

Educators and civil society actors across all four countries also reported limited institutional support for adapting content to local contexts and reliance on externally produced teaching resources. These challenges were described in both urban and rural settings, suggesting system-wide capacity constraints rather than isolated gaps.

Despite these institutional constraints, the reviewed policy documents also recognize the role of non-formal education, civil society organizations, and youth organizations in supporting climate awareness, capacity building, and public engagement (Government of the Kyrgyz Republic, 2021a; Government of the Republic of Kazakhstan, 2021; Government of the Republic of Tajikistan, 2015; Government of the Republic of Uzbekistan, 2019). Interviewees from Kyrgyz Republic and Kazakhstan provided several examples of non-formal education initiatives led by NGOs and youth organizations that employ participatory and experiential approaches to climate learning, including youth-led environmental projects and community-based disaster preparedness activities. However, these initiatives are often short-term and remain weakly integrated into formal education systems, limiting their influence on national teacher development, curriculum planning, and institutional decision-making. A respondent from Tajikistan similarly cautioned that youth participation in Central Asia is often symbolic instead of creating substantive changes:

“Often young people are invited to conferences just to tick a box and show that they are involved, but in fact their opinion is not taken into account. They make beautiful speeches, but their contribution goes unnoticed ... With ideal ideological views, they remain unappreciated in ministries and other power structures.” (Tajikistan respondent) (translated from Russian)

These findings indicate that education-sector capacity remains uneven across the four countries, particularly in relation to teacher development, locally relevant learning resources, and the integration of non-formal innovations into formal education systems.

School-Level Practice and Local Implementation

At the school level, CCE-PPP indicators focus on school planning, coordination, partnerships, and localized climate action. Across the four countries, evidence suggests that school-level engagement with CCE remains fragmented in planning and contingent on external support.

Current policy documents in these four countries have provided limited guidance on how schools are expected to operationalize climate-related learning, especially in regard to school-based climate action and partnerships with local communities. Climate-related initiatives, where present, are typically framed as pilot projects or extracurricular activities rather than as integral components of school governance. Evidence from our interviews illustrated how these policy gaps manifest in practice. In Kazakhstan and Uzbekistan, school-level climate activities were frequently described as project-based initiatives supported by NGOs or international partners, with limited continuity once external funding ends. In the Kyrgyz Republic, respondents highlighted NGO-supported efforts to improve school safety and energy efficiency, while noting persistent challenges for rural schools and students with disabilities. In Tajikistan, interviewees emphasized that centralized governance structures leave limited space for schools to adapt climate-related learning to local environmental conditions or to build sustained partnerships with communities.

These policy limitations have practical consequences for how schools engage with climate education. Climate-related teaching and learning were often perceived as an additional responsibility across the four countries, rather than an integrated component of core teaching practice, particularly in contexts where staffing and material resources are already stretched. Respondents in the Kyrgyz Republic and Tajikistan emphasized that limited staffing and heavy administrative workloads restrict opportunities for sustained community engagement, while interviewees in Kazakhstan and Uzbekistan noted that schools rarely receive dedicated resources or formal mandates to support climate-related initiatives. A Tajikistan NGO respondent argued that the Ministry of Education could “use the accumulated experience and materials of NGOs and international organizations” by establishing a platform under the Ministry’s auspices, but also emphasized that “without legislative support,” implementation is especially difficult in remote areas where teachers already have heavy responsibilities and low salaries. This situation shows that CCE

in these countries remains peripheral to everyday school operations rather than systematically supported within education systems.

Cross-Cutting Challenges in Equity and Inclusion

Equity and inclusion constitute a cross-cutting dimension of the CCE-PPP framework, shaping how climate education is accessed, experienced, and acted upon across different levels. Across the four countries, NDCs commonly referenced women, youth, vulnerable groups, rural populations within broader commitments to social inclusion and participation in sustainable development (Government of the Kyrgyz Republic, 2021c; Government of the Republic of Kazakhstan, 2023; Government of the Republic of Tajikistan, 2021; Government of the Republic of Uzbekistan, 2021). However, the extent to which these commitments inform concrete CCE design and implementation remained unclear.

Groups such as learners with disabilities, ethnic minorities, and linguistically marginalized communities are largely absent from climate-related education policy texts. Where equity considerations do appear, they are typically referred to in generalized terms, such as principles of equal access or participation for vulnerable groups, without clear implications for curriculum design, teacher preparation, learning materials, or resource allocation. A Kyrgyz Republic respondent noted that inclusion issues were often treated as the responsibility of the Ministry of Education, even though climate vulnerability and educational exclusion cut across sectors. As a result, equity functions more as a normative aspiration than as an operational criterion guiding CCE planning and delivery.

Interview data further illustrate how these policy gaps are experienced in practice. Respondents in Tajikistan and the Kyrgyz Republic emphasized that rural communities face intersecting challenges related to climate vulnerability, infrastructure constraints, and limited educational resources. Despite these compounded risks, CCE initiatives often proceed without explicit attention to differentiated learning needs or structural barriers, which may risk reproducing existing inequalities instead of addressing them. In the Kyrgyz Republic, one respondent described how mountainous conditions and multi-floor school buildings complicate access for students with physical mobility challenges, whose needs often remain unaddressed. In Kazakhstan and Uzbekistan, interviewees noted that inclusive education policies and reforms have gained greater visibility at the national level, particularly with respect to disability inclusion and gender equity. However, these inclusive education agendas are rarely referenced in climate-related learning or teacher training materials. A respondent from Kazakhstan emphasized the need to connect CCE more closely with local realities and inclusive approaches:

“Climate issues in our nation and education system are not always associated with health or inclusive approaches ... We often focus on the global aspects and unfortunately overlook the more important nuances. In my view, we need to start looking at these issues ‘from the bottom’, from a smaller level.” (Kazakhstan respondent) (translated from Russian)

Interview data from the Kyrgyz Republic and Tajikistan further indicate that limited availability and use of data disaggregated by location, disability status, language, or socioeconomic background constrain the ability of education authorities to identify differentiated needs, monitor participation, or design targeted interventions. When considered alongside the patterns observed in policy documents, these findings point to equity and inclusion functioning more as stated principles than as operationalized dimensions in education. Although inclusive commitments are widely articulated, they are not yet consistently embedded within the planning, implementation, or evaluation of CCE, which limits their capacity to respond to differentiated vulnerabilities and lived realities.

DISCUSSION

This study set out to examine how CCE policy and practice can be assessed more holistically, what such an assessment reveals about the current state of CCE in Central Asia, and what opportunities for transformation emerge from this analysis. Addressing these questions through the CCE-PPP framework sheds light on persistent patterns in how CCE is positioned and implemented, and what this means for transformation in policy and practice. The findings also demonstrate that the CCE-PPP framework enables a system-level understanding of CCE that is not captured by existing fragmented approaches.

Assessing Climate Change Education Through a Holistic Framework

The first research question examined how national CCE policy and practice can be assessed more holistically through a shared analytical framework. Applying the CCE-PPP framework shows the value of a multi-level perspective that moves beyond fragmented or sector-specific assessments by examining national governance, education-sector delivery, school-level implementation, and cross-cutting equity considerations together. This approach makes visible not only the presence of CCE references, but also how responsibilities, resources, and monitoring mechanisms are distributed across governance levels. In doing so, it highlights structural misalignments, such as situations where ambitious climate commitments are not matched by education-sector mandates or school-level support. The framework therefore contributes to the literature by operationalizing calls for whole-of-system approaches to climate education (Gibb, 2016; GPE, 2023a) in a way that remains analytically tractable and context-sensitive.

Beyond its analytical function, the CCE-PPP framework also serves as a practical planning tool. It provides a structured basis for defining CCE indicators, mapping existing policy and practice, identifying under-addressed areas, and tracking progress over time, as well as supporting closer alignment among climate education priorities, equity and contextual relevance, and broader adaptation goals. Its adaptable design offers potential for application in other regions facing similar challenges.

Understanding the Current State of Climate Change Education in Central Asia

Applying the CCE-PPP framework across four Central Asian countries reveals a region-wide pattern of uneven institutionalization of CCE. While climate change is widely recognized as a strategic development concern, education remains weakly positioned within national climate governance. This finding aligns with international evidence showing that education is often treated as a supportive or symbolic component of climate policy rather than as a core adaptation strategy (Kwauk, 2022; UNESCO & MECCE, 2023).

Analysis based on the CCE-PPP dimensions helps explain this pattern. First, structural misalignment across governance levels weakens education system planning, financing, and accountability mechanisms, limiting the effective institutionalization of CCE. This pattern aligns with findings in the literature showing that education policy alignment with climate goals often remains aspirational rather than operational (Berryman & Sauvé, 2016; Huang et al., 2021).

Second, the framework highlights how capacity constraints at the education-sector and school levels reinforce narrow pedagogical approaches. In the four Central Asian countries, climate-related learning is most often addressed within individual subjects, with limited evidence of cross-curricular integration. This reflects long-standing rigid curricula, as well as education systems that tend to favour safer approaches and offer limited support for interdisciplinary, socio-emotional, or action-oriented teaching. Such findings resonate with global analyses showing that most education systems continue to emphasize cognitive learning outcomes while under-supporting transformative or participatory approaches to CCE (Leichenko et al., 2022).

Third, the cross-cutting equity dimension reveals a persistent gap between inclusive rhetoric and implementation. Although women, youth, and vulnerable groups are frequently referenced in national strategies, the absence of disaggregated data, targeted indicators, and inclusive pedagogical guidance constrains meaningful integration of equity into CCE practice. This supports broader climate justice scholarship that cautions against assuming that inclusion language alone leads to equitable outcomes (Islam & Winkel, 2017).

Identifying Opportunities for Transforming Climate Change Education Policy and Practice

The holistic assessment enabled by the CCE-PPP framework points to a set of interconnected opportunities for strengthening CCE planning, policy, and practice across Central Asia. These opportunities require reorienting CCE toward a more coherent, equity-centered, and systemically embedded component of climate adaptation.

One key opportunity lies in enhancing the policy visibility and coherence of CCE. The study reveals that climate education is frequently subsumed within broader environmental or sustainable development agendas, which dilutes its focus and limits accountability. Developing standalone or clearly articulated CCE strategies, aligned with national climate vulnerabilities and education priorities, could provide a clearer organizing vision for action. This is particularly relevant in contexts where education sector plans

do not translate climate adaptation commitments into concrete objectives or delivery mechanisms. Strengthening the alignment between climate commitments and education planning would help ensure that CCE is not just referenced in policies but systematically integrated into the strategic planning across different levels.

The framework also points to opportunities to broaden how CCE is conceptualized and delivered. A more transformative approach would involve mainstreaming climate themes across disciplines, including humanities, social sciences, and civic education, while grounding learning in local environmental and socio-economic contexts. Updating teaching materials in national and minority languages, and ensuring access for rural schools, represents a practical entry point for making CCE more relevant and meaningful to learners' lived experiences. Teacher preparedness also emerges as an essential leverage point. Sustained investment in pre-service and in-service professional development could equip teachers with interdisciplinary climate knowledge and participatory teaching approaches, helping them to adapt to emerging risks and evolving climate contexts.

The equity and inclusion dimension of the CCE-PPP framework reveals that groups facing existing educational disadvantage, including rural communities, learners with disabilities, and linguistic minorities, are least likely to benefit from current CCE efforts. This pattern reflects what climate justice scholars describe as "double exposure," where social marginalization and climate vulnerability reinforce one another (O'Brien & Leichenko, 2000). Transformative opportunities therefore lie in integrating equity considerations directly into CCE design through inclusive curricula, targeted infrastructure investments, multilingual resources, and participatory approaches that reflect local realities. Without such measures, CCE risks reproducing, rather than mitigating, structural inequalities.

Finally, the study highlights the importance of strengthening coordination across governance levels and promoting the leadership of youth and civil society. Enhancing inter-ministerial coordination mechanisms and inclusive consultation platforms could support more coherent policy development. At the same time, youth-led and NGO-driven initiatives, particularly visible in Kazakhstan and the Kyrgyz Republic, demonstrate innovative pedagogical practices and strong community engagement that remain underutilized within formal education systems. Creating stronger linkages between these grassroots initiatives and formal education governance through institutional recognition, stable financing, and cross-sector partnerships would help integrate bottom-up innovation into top-down planning and implementation.

CONCLUSION

This study contributes an integrated analytical framework (CCE-PPP) for assessing how CCE is positioned and implemented across national strategy, education system, school practices, and cross-level equity concerns. Its application in four Central Asian countries reveals that the limited impact of CCE does not primarily stem from a lack of

policy attention, but from persistent misalignment between policy commitments, education system capacity, and implementation across governance levels. This misalignment results in CCE being present in policy discourse while remaining peripheral in education planning, delivery, and accountability structures.

The findings further suggest that strengthening CCE requires more than expanding policy commitments or curricular content. It requires embedding climate education within the core functions of education systems, including planning, financing, teacher development, and monitoring, as well as aligning these processes with broader climate adaptation priorities. This study moves beyond an assessment of whether CCE is present in policy documents to examining how it is institutionalized across governance levels, offering a more comprehensive understanding of the complex conditions that enable or constrain effective implementation.

More broadly, the CCE-PPP framework provides a systems-level approach for analyzing the coherence of CCE across governance levels and identifying leverage points for strengthening institutional capacity, policy coherence, and more equitable implementation in diverse national contexts.

Limitations and Future Research

The scope of the findings in this study is shaped by its focus on national policy documents and the extent to which diverse stakeholders could be reached for interviews. The analysis drew on 38 documents and 11 interview records representing 15 respondents from different organizations or governmental bodies, which enabled a system-level understanding of CCE across countries. However, the dataset places less emphasis on longer-term or field-based research into how CCE is experienced and enacted in specific local communities within these contexts. The utility of the CCE-PPP framework is also closely tied to the availability and quality of data across sectors, countries, and regions. In contexts where data remain limited or insufficiently disaggregated, its ability to assess equity dimensions or localized implementation may be constrained.

This points to an important area for future research, where framework-based analysis can be complemented by participatory and community-based approaches to capture the lived experiences of learners, educators, and communities facing climate-related challenges.

Future research could also extend the application of the CCE-PPP framework to other regional contexts to enable comparative analysis and refinement of its indicators. Strengthening collaboration among regional and national institutions, researchers, and participants will be important for generating more localized, disaggregated, and context-sensitive data, and for supporting more grounded and responsive approaches to CCE policy and practice.

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writing – review & editing; **MT**: data curation, investigation, project administration, writing – review & editing. All authors agreed with the results and conclusions.

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APPENDIX A: NATIONAL DOCUMENTS REVIEWED

Kazakhstan

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APPENDIX B

Table B1. Climate change education analytical framework for planning, policy, and practice (CCE-PPP)

Level	Dimension	Key themes	Indicators
National	Policy commitment to CCE	• CCE in national policies/visions/strategies • CCE in educational planning • Country's engagement with global frameworks relevant to CCE	• Which global strategies/frameworks relating to CCE have these countries committed to? • Which national policies/visions/strategies (henceforth: "policies") discuss CCE? • Which goals/objectives/measurable targets on CCE are included in the national policies? • To what extent is education a priority sector for national climate change efforts? • How do the national policies connect to the following CCE approaches: gender-responsive; intersectional; based on science; engaging students: fostering: specific, generic, and transformative capacities/civic engagement/climate action/awareness of climate justice; future careers in a green economy? • Do national policies protect children's right to education, especially in the context of climate-related disasters and disruptions? • Is CCE compulsory or optional? • At which levels of education is CCE provided? • What is the role and contribution of the Ministry of Education and education sector in national policies? • How do education policies integrate climate change, disaster risk, environmental considerations and goals?
	CCE financing	• Definition of climate-related financing in education budgets and education-related financing (if any) • Financing mechanisms	• Do climate budgets have a clear definition of climate-related financing in education budgets and education-related financing? • What domestic financial mechanisms are mobilized (currently or planned) in support of efforts to make the education system more climate change responsive? • How are financial resources for CCE allocated between different levels of education and training (K-12, higher education, TVET, adult learning)? • What equity-based financing mechanisms are included in CCE financing? • What plans exist to draw in international climate funding to the education sector and make greater use of disaster risk financing in the sector?
	National planning, monitoring & evaluation	• Source of data/evidence to inform a) CCE and b) assessing the impacts of climate change on children, communities and schools • Management of data • Monitoring and evaluation	• Which climate change-related data / evidence (qualitative and quantitative) is needed to inform planning, implementation and monitoring a) CCE and b) the impacts of climate change on children, communities and schools? How will this data be collected? • Which data system(s) would be used to manage this data? How will the data be analyzed? In which user-friendly and accessible ways will the data be disseminated? • How is CCE monitored and evaluated at national level? • How can civil society support the monitoring of policy implementation, service delivery and threats to local natural environments?
	Inter-sectoral coordination	• Coordination with authorities responsible for climate change, environment and disaster management • Role assigned to the Ministry of Education • Collaboration with other relevant ministries and initiatives	• What communication and coordination mechanisms exist between education authorities, authorities responsible for climate change, environment and disaster management as well as other relevant ministries and agencies? • Does the ministry of education actively engage in high-level multisectoral platforms on climate, disaster risk and environmental action? • What collaboration exists between the ministry of education, relevant line ministries and humanitarian and development partners for the gathering, sharing, analyzing and disseminating of climate change, environmental and disaster-related data concerning children and schools? • What involvement do different ministries (ministry of education as well as other government ministries, departments and agencies responsible for natural environment, climate change, and disaster management coordination) and teachers have in the CCE curriculum development process? • How do education institutions involve different stakeholders, including students and members of the local community—including Indigenous and religious leaders, in the co-production of knowledge for CCE; climate action plan development/implementation/revision?

Table B1 (Continued).

Level	Dimension	Key themes	Indicators
Education sector	Education infrastructure	- National provisions for climate-resilient education infrastructure - School-level physical environment for CCE learning	- What provisions are included in national policy for greening/safe, climate-proof and climate-resilient education infrastructure? How are gender-responsive and disability-inclusive guidelines considered? - When new schools are being built, what steps are taken to ensure they are safe from natural hazards and protect the environment? How are gender-responsive and disability-inclusive guidelines considered? - In building or refurbishing schools, is priority given to sustainably produced or locally sourced materials, ensuring that the extraction of the materials does not contribute to the deterioration of local ecosystems? - What steps are being taken to use renewable and clean energy (for example, solar) solutions in education infrastructure? - How do schools engage with school and community stakeholders regarding school infrastructure development? - What CCE learning opportunities are in place that use the built school environment (for example, food gardens)?
	Teaching and learning	- Teacher development (pre-service and in-service) - Learning and curriculum (including content, learning approaches, assessment, and wellness)	- What capacity building opportunities, resources and mutual learning opportunities are available for CCE in relation to teacher training/professional development/professional autonomy and academic freedom? - What mechanisms are in place to ensure that teachers are well-supported to teach climate change in an inclusive and just manner? - What knowledge, skills, values, and attitudes exist in different subjects and through the grades integrating climate change, sustainability, disaster risk reduction and environmental conservation through a gender equality lens? - How do these approaches match the priorities identified in the national policies? - What interdisciplinary or transdisciplinary learning approaches are employed? - To what extent are active, participatory, action-oriented and experiential forms of pedagogy deployed? - To what extent are teaching and learning materials culturally relevant, locally grounded, and responsive to the environmental, social, and linguistic contexts in which learners live? - What psychosocial support and social and emotional learning is available to take care of student emotional well-being in the face of natural disasters, environmental loss and the climate crisis? - How is student assessment being used to assess not only knowledge acquisition but also skills, and attitudinal and behavioral shifts? - What school- and community-based platforms for student climate change, disaster risk and environmental action and learning exist? How are they resourced?
	Capacity building	- Cooperations that supports capacity building - Capacity building approaches (including role of research and plans of public awareness-raising)	- What role does international cooperation (including ODA, open access to resources, capacity building, technical assistance, South–South learning opportunities) play in supporting education system strengthening and sharing of good practices in the context of climate change? - What role does research play in strengthening the scientific base on climate change (for the purposes of strengthening CCE)? - How is capacity to finance/plan for/implement/monitor CCE being developed, and awareness being raised within national/subnational government departments? - How are students and the education workforce being empowered to develop leadership skills in CCE and to engage in politics relating to their environment and participate in decision making?
School	School level planning and coordination	- School-level disaster management plans - Partnerships to engage in climate change, disaster risk and environmental action - Equity concerns in schools (especially for women, children and marginalized groups in school level planning and coordination efforts)	- Is there a school disaster management or contingency plan with a focus on localized climate change threats? - What steps do schools take to conduct climate change risk assessment and wider consultations with students, school staff, and community members? - How do schools engage in processes/consultations/partnerships with families, other schools, local businesses, community centers, and other stakeholders regarding CCE, climate change, disaster risk and environmental action?

Table B1 (Continued).

Level	Dimension	Key themes	Indicators
Cross-cutting	Equity & inclusion	• Recognition of and ways to address specific needs and climate-related vulnerabilities • Decision-making process in including voices from women, youth, children and indigenous communities • Approaches to promote diversity, equity, and inclusion of cultures, knowledge, epistemologies, and other ways of knowing and being	• How are gender-specific concerns considered during school level planning and coordination efforts? What steps can schools take to ensure that gender-specific concerns and proposals are fully expressed and considered?
			• How do national policies on CCE envisage the role of/needs of a) education unions and student organizations, b) vulnerable populations of students, including Indigenous groups, out-of-school girls and boys, poor communities, people with disabilities, people of color, women, girls, and children? • To what extent do national policies recognize the disproportionate impacts of climate-driven crises on the most vulnerable, including girls, and include processes that are responsive to these impacts and give voice to both girls and boys, women, Indigenous and minority communities, and those with special needs? • How are specific groups differently impacted by climate change? • How do national policies promote diversity, equity, and inclusion of cultures, knowledge, epistemologies, and other ways of knowing and being? • How does CCE address the specific needs of diverse geographic and demographic contexts? • What processes exist to involve students and youth in decision-making processes related to climate change actions? • Are data disaggregated according to age, sex, disabilities, location and other relevant demographic and socio-economic characteristics to enable targeted interventions that better address specific needs and climate-related vulnerabilities? • How are gender and gender norms integrated in climate change-related curricular content and learning outcomes?