

Schools Connect

Global priorities for enhancing school-based climate change and sustainability education

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Research









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About the UCL Centre for Climate Change and Sustainability Education

UCL's Centre for Climate Change and Sustainability Education (CCCSE) aims to support teachers in England to develop expertise that they need to prepare young people for a climate-altered future. This aim is achieved by three workstreams: (i) research to address pressing questions related to climate change and sustainability education policy and practice; (ii) design and implementation of professional development for teachers and school leaders; (iii) international engagement to enhance the implementation of quality climate change and sustainability education in England and further afield.

About the British Council

The British Council supports peace and prosperity by building connections, understanding and trust between people in the UK and countries worldwide. We uniquely combine the UK's deep expertise in arts and culture, education and the English language, our global presence and relationships in over 100 countries, our unparalleled access to young people and influencers and our creative sparkle.

We work directly with individuals to help them gain the skills, confidence and connections to transform their lives and shape a better world in partnership with the UK. We support them to build networks and explore creative ideas, to learn English, to get a high-quality education and to gain internationally recognised qualifications.

We work with governments and our partners in the education, English language and cultural sectors, in the UK and globally. Working together we make a bigger difference, creating benefit for millions of people all over the world. We work with people in over 200 countries and territories and are on the ground in more than 100 countries. In 2021–22, we reached 650 million people.

Executive summary

This report describes the activities and outcomes of a consultancy project carried out between May and September 2023 by UCL's Centre for Climate Change and Sustainability Education (CCCSE), on behalf of the British Council. The project aimed to develop recommendations that could identify, support and enhance the ongoing climate change education priorities of the British Council's Schools Connect Programme and build on the British Council's ongoing body of work in this space, for example, <u>The Climate Connection</u>, British Council (2020) and *Culture:* <u>The Missing Link to Climate</u> <u>Action</u>, British Council (2021) and those of other international government and non-government organisations. This report provides an overview from the research literature as to what constitutes 'quality' climate change and sustainability education and outlines broad challenges including:

- 1. The complex and potentially contentious nature of climate change education.
- 2. A continued focus on teaching climate change and sustainability through separate school subjects which limits opportunities for holistic and cross-curricular teaching.
- 3. The ongoing need for high-quality teacher professional development in relation to climate change and sustainability education.

With these challenges in mind, we highlight the importance of climate change and sustainability education, which includes **varied responses and approaches that respond to context and culture**.

This report aims to share the ways in which international non-governmental organisations can enable climate change and sustainability education to flourish, including through partnership and reciprocal learning, and dialogue between educators, policy makers, young people and children across the world.

In response to this aim, we present three case studies of climate change and sustainability education projects led by the British Council in India, Iraq and Zambia; these exemplify the varied approaches to developing and enhancing climate change education in partnership with international government and non-government organisations, such as the British Council. These three countries have been included as climate change and sustainability education has been identified as a priority for their work as part of the British Council's Schools Connect programme.





The project included three phases:

Phase 1: Literature review

We completed a desk-based review of literature and selected curriculum materials/strategies on the global context of climate change education, which included:

- A broad overview of current global policy with regards to climate change and sustainability education including exemplars from the four jurisdictions of the UK, as well as a range of other international contexts.
- A broad overview of different understandings of effective climate change and sustainability education, with a focus on the role of formal school education in responding to the climate change.
- An exploration of different approaches to climate change and sustainability education within formal schooling.
- A reflection on the challenges for policy and practice in relation to school-based climate change and sustainability education.

Whilst this review is in no way an exhaustive or a systematic review of the literature, we ensured that it included a range of documents written for different audiences, including those drawn from the academic literature (e.g., journal articles, book chapters) and wider literature (e.g., policy briefs, NGO reports and/or action plans, national curriculum documents).

Phase 2: Focused case study research for India, Iraq and Zambia

These case studies were selected as these countries had identified climate change and sustainability as a priority for their work through the British Council's Schools Connect programme. Drawing on our previous in-depth study of the context of Iraq (Rushton & Greer, 2023), we developed case studies of climate change education in India, Iraq and Zambia. This included:

- A review of each country's context in relation to climate change, schooling and policy, with a focus on the place of climate change and sustainability education.
- Discussion and dialogue with British Council colleagues with in-depth expertise of the British Council's work in India, Iraq and Zambia.
- Recommendations on approaches to sharing and amplifying existing policy and practice.

Phase 3: Thematic analysis

Analysis of data from Phases 2 and 3 enabled us to achieve the following aims:

- To provide an overview of the global context of school-based climate change and sustainability education.
- To identify clear priority areas for the ongoing work of the British Council and other government and non-governmental organisations in relation to climate change and sustainability education and the Schools Connect programme.
- To make recommendations on potential avenues for government and non-governmental organisations at national and international levels to impact global progress in these areas.

The report begins with an overview of the global context of climate change and sustainability education in schools followed by three case studies of India, Iraq, and Zambia.



Summary of findings

Here, we provide an overview of findings drawn from this report to inform possible priority or opportunity areas for the work of the British Council and other international non-governmental organisations, with the aim of enhancing climate change and sustainability education globally. We have synthesised these by drawing on the wider research literature and the three case studies of the British Council's work in India, Iraq and Zambia and to begin, we provide a summary of findings from each of these sections.

Summary of insights from the research literature

Key findings from a review of the research literature highlight that effective climate change and sustainability education should attend to the following points:

- Climate change and sustainability education should include personally relevant and meaningful
 information and use approaches to teaching which are active and student-centred and which
 empower children and young people.
- Climate change and sustainability education should draw on participatory and creative approaches from multiple disciplines which attend to the scientific, social, ethical and political complexities.
- Whole-school approaches are recognised as valuable in the context of climate change and sustainability education.
- Providing access to high-quality teacher professional development is a key mechanism in enhancing school-based climate change and sustainability education.
- Partnership working with international non-governmental organisations, including sharing high -quality resources and monitoring and promoting engagement and action, is a vital part of ensuring every young person accesses high-quality climate change and sustainability education.

Summary of insights from the three country case studies

The country case studies of **India**, **Iraq and Zambia** exemplify how each country, region and community can experience the impacts and engage with the realities of climate change in varied and distinct ways. This requires education which draws on a range of pedagogical approaches and contexts for learning so that all children and young people access high-quality climate change and sustainability education. A key mechanism for developing climate change education in all three countries is the education and professional development of teachers so that teachers are supported to develop and use approaches to teaching and learning in the context of climate change that are relevant and meaningful for children, young people and their wider communities. Key insights from each country are shared below.

INDIA

Environmental education is well established in formal education in India, which means India has a wealth of expertise and resources to draw from to enhance school-based climate change and sustainability education. Due to the size and diversity of India, each state has autonomy over the implementation of their education strategy, so any development of climate change education needs to work within each context. Building on the extensive programme of environment education already in place in India, we highlight two opportunities to further enhance climate change and sustainability education: enhancing both **holistic approaches** to climate change education; and **teacher professional development**. Environmental education in India currently integrates a range of subjects including science, geography and social sciences. To further develop this holistic approach, teacher professional development could focus on foregrounding current curriculum opportunities and identify further ways for teachers and school leaders to implement a holistic approach to school-based climate change and sustainability education.





IRAQ

Iraq's climate change and sustainability education is at an emergent stage in comparison to other nations and contexts. However, there is increasing government support for climate change and sustainability education including policy makers with responsibility for Education and the Environment from both Central State Iraq and the Kurdistan region. A key mechanism for developing Iraq's emergent climate change education is the **education and professional development of teachers**. In the Iraqi context, this could mean that teacher education and professional development of climate change and sustainability education which foregrounds the role of **extra-curricular activities**; these might include **student-centred and arts-based approaches** which engage and are supported by the **wider community**.

ZAMBIA

In Zambia, there is a need to **increase the general level of knowledge about the causes and impacts of climate change** that responds to the needs of diverse communities in Zambia. Furthermore, there is an urgent need to continue to **equip Zambia's population to adapt to the impacts** already experienced, especially those which threaten two major areas of the Zambian economy: farming and tourism. Education, including formal schooling, has a vital role to play in this response and Zambia's recent National Climate Change Learning Strategy provides a strong platform on which to build. Enhancing climate change education could include a focus on **raising awareness of the links between climate change impacts and agriculture** and supporting young people and their communities to develop agricultural practices which mitigate the impacts of climate change. **Conservation** is another key area of focus. This includes maintaining wildlife biodiversity and considering the ways in which tourism can be more sustainable and promote pro-environmental practices within and beyond the sector. Enhancing climate change and sustainability education could include **supporting young people to further understand biodiversity in their local contexts and the ways in which this can be monitored and maintained**.

Through synthesis of learning from the research literature and the three country cases studies, we share findings relevant for policy makers and governments seeking to identify, develop and enhance climate change and sustainability education that is relevant for their contexts.



Area one: Build, strengthen and enhance in-country knowledge and insight into effective climate change and sustainability education, including through sharing national and international good practice.

It is vital that future work to enhance climate change education responds to the **realities of climate change and schooling that are specific to each country and/or region, so that any developments are meaningful and authentic**. Communities, including school communities, will experience the impacts of climate change differently and will have variable access to resources. Therefore, further development of school-based climate change and sustainability education will need to be done with nuance and an appreciation for the complexity of the local, regional and national context. One key opportunity to develop in-country knowledge and expertise is to further **engage with climate change researchers** and those working to implement local, regional and national climate change mitigations and adaptations, perhaps drawing on **in-country university and industry expertise and networks**. It is important to recognise the **value of enhancing in-country knowledge and expertise through partnership working which draws on international good practice which supports achieving the strongest possible local offer**.

As well as drawing on in-country climate change expertise and responding to the diverse needs and contexts of schools, it is important that the development of climate change and sustainability education is **continuously informed by insights derived from dialogue involving a range of groups** who engage with or contribute to climate change and sustainability education. Key groups to involve include schools, teacher educators, researchers, community groups and policy makers with a focus on education and the environment. Such dialogue would benefit from approaches which bring groups together, especially through **intergenerational dialogue**, where sharing of knowledge and experiences of climate change and climate change and sustainability education between younger and older generations enables generations to understand each other's ideas and perspectives, without necessarily adopting them.

As well as understanding the local, regional, and national context of the impacts of climate change, it is also vital that future development of climate change and sustainability education is **attentive to the local schooling and higher education contexts**. This will ensure that climate change and sustainability education is **personally relevant and meaningful for both students and educators**. In this report, we have included case studies for Iraq, India and Zambia which outline some specific ways forward to enhance climate change and sustainability education, based upon our understanding of their varied contexts. These case studies could provide a template for future initiatives which seek to develop climate change and sustainability education that is context sensitive.

Finally, we are mindful that the research literature underlines the need for climate change and sustainability education to move beyond a focus on teaching and learning the facts of climate change and to include **participatory, creative and action-oriented approaches from multiple disciplines which respond to the affective dimension and empower children and young people**. Exploring **varied pathways** for enhancing climate change and sustainability education through both **curricular and extracurricular pathways** is needed and will depend on the educational policy context of a country and/or region.

REFLECTIONS ON THE CONTINUED ROLE OF THE BRITISH COUNCIL AND OTHER INTERNATIONAL NON-GOVERNMENTAL ORGANISATIONS IN AREA ONE

The British Council and other international non-governmental organisations frequently provide invaluable thought leadership in national and international climate change and sustainability education advocacy, particularly with policy makers in the areas of education and the environment. For example, the British Council is uniquely positioned to further this role, building on sustained and significant global programmes such as the Connecting Classrooms through Global Learning (CCGL) (lpsos & Learn More, 2022). During 2018–2022, CCGL operated in the UK and 29 overseas countries and enabled schools, teachers and students to develop the awareness, knowledge and skills to take action on local and global issues which promoted acceptance and tolerance and building understanding of global citizenship (British Ipsos & Learn More, 2022). COP28, held in the United Arab Emirates in November 2023, represents an important opportunity to showcase the British Council's expertise in climate change education, including systems-level change such as CCGL and the more recent case study work developed by British Council Iraq (Rushton & Greer, 2023). Drawing on the British Council's long-established role as an international thought leader, a continued priority could be to build, renew and strengthen a coalition of support to prioritise and resource climate change and sustainability education across the globe which builds on frameworks of global citizenship and promotes tolerance and acceptance.

Relatedly, the British Council has **significant expertise in developing education programmes which integrate in-country expertise**, such that programmes are authentic and meaningful. This expertise is an essential part of the support and guidance which should be made available to policy makers at international, national, and regional levels who are seeking to enhance climate change and sustainability education. Such guidance, and opportunities for dialogue across different groups, could be provided through British Council hosted workshops and knowledge exchange activities, perhaps consistent with those developed in previous climate change and sustainability education focused work, including recent work with policy makers in Iraq (Rushton & Greer, 2023) and much larger scale projects such as CCGL (British Council, 2022). These workshops and knowledge exchange activities could involve the contributions of a range of the British Council's partners, both international and in-country.



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Area two: Support and strengthen pathways to enhance teachers' access to high-quality professional development in relation to climate change and sustainability education.

The research literature and the three country case studies underline the varied nature and availability of climate change and sustainability education focused teacher professional development. An important aspect of this work will be to **identify the nature of current provision** in different contexts and countries, including through desk-based research and engagement with teachers, school leaders, teacher educators and policy makers. Relatedly, **making visible existing**, **high-quality and open-access** professional development resources and opportunities is also very important.

Depending on provision in a region and/or country, there is frequently the need to **understand and map the networks, resources and community expertise** which currently inform teacher professional development (for example, subject associations and professional bodies). This can also make visible the expertise of these and other groups and how they could support the development of climate change and sustainability education teacher professional development which is **locally relevant and meaningful**.

In developing new or enhancing current climate change and sustainability-focused teacher professional development, we underline the need to **combine both content knowledge** which draws on teachers' disciplinary and subject expertise, along with strategies to **support teachers' self-efficacy**. Teacher professional development should also be **flexible** so that teachers can translate specific climate change and sustainability concepts and/or pedagogies into their local practice. Much of the current research literature concerning climate change education and teacher professional development is from anglophone contexts, especially the USA. Therefore, there is a need to **develop insights from a broad range of cultural and disciplinary contexts** to ensure effective and meaningful programmes are developed.

Finally, we underline the need for teachers to belong to **communities of practice** throughout their careers which support their engagement with climate change and sustainability education. Such communities of practice should offer opportunities to **foreground cross-curricula and age-phase learning and collaboration and engage with a broad range of community groups and partners**.

REFLECTIONS ON THE CONTINUED ROLE OF THE BRITISH COUNCIL AND OTHER INTERNATIONAL NON-GOVERNMENTAL ORGANISATIONS IN AREA TWO There is a clear opportunity to build on the British Council's long-standing and highly valued work with schools and teachers as exemplified through CCGL (lpsos & Learn More, 2022), and for this to further extend across school-based climate change and sustainability education. One important role for the British Council could be to continue to showcase and disseminate high-quality climate change and sustainability education and teacher professional development programmes created by its partners, and support schools and educators in different contexts to integrate these programmes into their local practice. Recent examples of successful work in this area include the British Council's partnership to develop the open access MOOC, Learning for a Sustainable Future (Future Learn, n.d.). Relatedly, the British Council could have an important role in gathering feedback from those who have engaged with partners' programmes and ensure that insights from a range of contexts are incorporated into the further development of such programmes so that they continue to be authentic and meaningful for the greatest diversity of communities. As well as working with a range of partners to showcase their professional development programmes, the British Council could collaborate with partners and commission further resources and professional development support, perhaps targeted in areas which are currently in the 'emergent' phase of climate change education development. This could build on the model provided by recent work with British Council Iraq.

A further important role of the British Council is to provide international and/or local networks and spaces for teachers who are engaged in climate change and sustainability education to build and strengthen **communities of practice**. This could be achieved in a range of ways including online and in-person knowledge exchange events, curating and showcasing online examples of best practice, and enabling schools in different countries to engage with and support the work of others.

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The support of school leadership in relation to climate change and sustainability education is recognised as a very important factor in enabling and enhancing school-based climate change education. Leadership includes headteachers and other senior teachers, members of school councils and/or governing bodies and the school inspectorate. Wherever possible, climate change and sustainability education leadership groups should have youth representation and should have regular opportunities to engage with policymakers.

High quality-professional development focused on effective leadership of climate change and sustainability education should be made available to these groups involved in school leadership to support them to identify, resource and enhance excellent practice in their context. As with teacher professional development, a flexible approach, which combines content knowledge and models of best practice alongside strategies to support self-efficacy, is likely to be most effective. A priority for professional development could be to support school leaders to collaboratively author climate change and sustainability education improvement plans with their school community and to regularly self-evaluate progress.

School leaders would also benefit from opportunities to belong to **communities of practice which support their leadership of climate change and sustainability education** in a whole school approach which incorporates teaching and learning, school site and operations, school governance and engagement with the wider community. These communities of practice represent important opportunities for schools to learn from each other, rather than be framed as an opportunity to competitively rank schools' practice.

REFLECTIONS ON THE CONTINUED ROLE OF THE BRITISH COUNCIL AND OTHER INTERNATIONAL NON-GOVERNMENTAL ORGANISATIONS IN AREA THREE

Consistent with area two, the British Council and other international non-governmental organisations have an important potential role to provide networks and spaces for school leaders in relation to climate change and sustainability education, which build and strengthen **communities of practice**. As with area two, this could be achieved in a range of ways including online and in-person knowledge exchange events, curating and showcasing online examples of international best practice, and enabling school leaders in different contexts and countries to engage with and support the work of others. The British Council has a well-established track-record of working with partners to create high-quality and open access climate change and sustainability education, for example *Learning for a Sustainable Future MOOC* (Future Learn, n.d.), which provides a strong foundation for future development of resources and communities of practice.

Furthermore, given the importance of school leadership in the context of climate change and sustainability education and, for example, the emphasis on leadership in the Department for Education's climate change and sustainability strategy (DfE, 2022), there is a need for school leaders to access and engage with high-quality professional development. Working with partners, the British Council would be well placed to develop and/or commission a professional development offer that **enables school leaders to collaboratively author and implement a climate change and sustainability education 'action plan**'. These action plans could conceptualise climate change and sustainability education as a whole-school approach and include actions across the areas of curriculum, community, culture and campus. Support for school leaders could helpfully integrate **regular self-evaluation and improvement** as part of climate change and sustainability education and improvement as part of climate change and sustainability education and improvement as part of climate change and sustainability education and improvement as part of climate change and sustainability education and improvement as part of climate change and sustainability education and improvement as part of climate change and sustainability education and improvement as part of climate change and sustainability education action plans.

As the country case studies of India, Iraq and Zambia exemplify, each country, region and community can experience the impacts and engage with the realities of climate change in varied and distinct ways. This requires education which draws on a range of pedagogical approaches and contexts for learning so that all children and young people access high-quality climate change and sustainability education. A key focus for governments and international non-governmental organisations should be prioritising and valuing teacher professional development focused on climate change and sustainability education. Such professional development should be undertaken in partnership with teachers, school leaders, academics, subject associations and teachers' professional bodies as well as wider education communities, including children and their families and draw on international best practice. This focus is important in both contexts where climate change and sustainability education is well-developed as well as more "emergent', as enabling and empowering teachers is vital in developing and implementing transformative climate change and sustainability education.

Abbreviations

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ACE	Action for Climate Empowerment	
AoLE	Areas of Learning Experience	
вс	British Council	
BERA	British Educational Research Association	
сс	Climate Change	
CCE	Climate Change Education	
CCEA	Council for the Curriculum, Examinations & Assessment (Northern Ireland)	
CfE	Curriculum for Excellence (Scotland)	
DE	Department of Education (Northern Ireland)	
DfE	Department for Education (England)	
DRR(E)	Disaster Risk Reduction (Education)	
EE	Environmental Education	
EFA	Education for All	
EfS	Education for Sustainability	
EfES	Education for Environmental Sustainability	
ESD	Education for Sustainable Development	
ESDGC	Education for Sustainable Development and Global Citizenship	
ESE	Environment and Sustainability Education	
ETI	Education and Training Inspectorate (Northern Ireland)	
GCE/EGC	Global Citizenship Education/Education for Global Citizenship	
GCSE	General Certificate of Secondary Education	
GTCS	General Teaching Council for Scotland	
GRZ	Government of the Republic of Zambia	
HEA	Higher Education Academy	

IUCN	International Union for Conservation of Nature	
ITE	Initial Teacher Education	
LES	Learning for Environmental Sustainability	
LfS	Learning for Sustainability	
MECCE	Monitoring and Evaluating Climate Communication and Education Project	
NAEE	National Association for Environmental Education	
NCCLS	National Climate Change Learning Strategy	
NHM	Natural History Museum	
NIEL	Northern Ireland Environment Link	
Ofsted	Office for Standards in Education, Children's Services and Skills	
SDGs	Sustainable Development Goals	
SQA	Scottish Qualification Authority	
STEM	Science, Technology, Engineering and Mathematics	
TPD	Teacher Professional Development	
UCL CCCSE	University College London's Centre for Climate Change and Sustainability Education	
UK	The United Kingdom of Great Britain and Northern Ireland	
UN	United Nations	
UNFCCC	United Nations Framework Convention on Climate Change	
UNESCO	United Nations Educational, Scientific and Cultural Organisation	
ZECF	Zambia Education Curriculum Framework	

1.0 An overview of the global context of school-based climate change and sustainability education

Key insights

- Climate change and sustainability education is represented and implemented in education through a range of terms including Environmental Education, Education for Sustainable Development and Global Citizenship Education.
- The term 'sustainability' is described, understood and used in different ways which can both emphasise economic development as well as supporting citizens to live in ways which support future generations to live on a healthy planet.
- Whilst climate change and sustainability education features in about half of national policy documents globally, research shows that this is often superficial and fragmented and predominantly focused in science and geography curricula.
- International NGO engagement with climate change and sustainability education emphasises the need for whole-school approaches.
- Across the four jurisdictions of the UK, climate change and sustainability education is implemented in different ways including developing young people's capabilities to act for the environment and ensuring young people learn about the scientific facts about climate change and environmental degradation.
- Systematic reviews of the research literature underline that effective climate change and sustainability underline the need for approaches which move beyond learning about the facts of climate change and embrace multi-disciplinary approaches which draw on varied pedagogies which are student-centred, relevant, and meaningful.

1.1 Scope of the literature review

Approaches to scoping the literature were flexible, pragmatic and rapid rather than a systematic quantitative literature review (e.g., Rousell & Cutter-Mackenzie-Knowles, 2020 or Eilam, 2022). We drew on our existing knowledge of the climate change and sustainability education literature, including both academic and non-academic sources. This was a starting point to identify further items via internet-based searches and through seeking recommendations from colleagues drawn from across UCL CCCSE's and British Council's extensive professional networks. This report is informed by a series of extensive systematic reviews of climate change and sustainability education literature and policies drawn from published academic literature (e.g., Monroe et al., 2019; Rousell & Cutter-Mackenzie-Knowles, 2020; Holst, 2023; Taylor et al., 2019; Trott et al., 2023) and also grey literature (Eilam, 2022). This is supplemented by non-academic literature which includes action plans authored by NGOs (e.g., NIEL, 2021; UNESCO 2021a); national education guidance (e.g., GTCS, 2021) and national climate change and sustainability strategy documents (e.g., DfE, 2022).

In what follows, we consider global policy making in relation to climate change and sustainability education and include a focus on the four jurisdictions of the UK. We then explore effective strategies for climate change and sustainability education as part of formal education with a detailed consideration of four approaches. Finally, we reflect on the challenges which schools encounter in the context of climate change and sustainability education.

1.2 Policy making and climate change and sustainability education

The term 'sustainability' is a polysemic concept. Sustainability can be understood as education which supports citizens of today to live environmentally restorative lives which maximise opportunities for future generations to live on a healthy planet. However, conceptualisations of sustainability can also include social and economic framings which emphasise economic development. Therefore, depending on the use of the term sustainability, it can both challenge and reproduce systems and decision making which have led to current global environmental crises. A key term in the academic literature and policy making is Education for Sustainable Development (ESD), which came to the fore as part of international conferences and agreements in the 1980s and 1990s such as Our Common Future (World Commission on Environment and Development (WCED), 1992). As with 'sustainability', there is no one definition of ESD and the concept has developed from the fields of Environmental Education (EE) and Development Education (DE) in a complex and complicated evolution (Hart & Nolan, 1999; Marcinkowski, 2009; Kopnina, 2012). The importance of education in achieving sustainable development was demonstrated by the United Nations, with the 'Decade of Education for Sustainable Development' (2004–2015) and continued beyond 2015 with the launch of the 2030 Sustainable Development Goals (SDGs) (Glackin & King, 2023). The 17 SDGs represent a global partnership of 193 countries to end poverty, reduce inequality, improve health and education, encourage economic growth whilst responding to climate change and biodiversity loss (UN, 2023a). The importance of education in achieving sustainable development is captured in Goal 4, 'Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.' (UNESCO, 2021b). SDG Target 4.7 further foregrounds education for sustainable development, saying:

By 2030, 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, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development. (UNESCO, 2021b).

But what is understood by the term education for sustainable development? Wals (2009) understands ESD to mean learning that promotes 'sustainable development'; and that 'sustainable development' represents a desire to move away from existing models of development which leave the needs of the planet and people unbalanced, towards those models which support a prosperous and peaceful world for all (Wals, 2009). Vare and Scott (2007) outline two types of ESD. Type one promotes and facilitates changes in what we do and promotes informed and skilled ways of thinking and behaviours in the short term where there is a clearly identified need. Type one ESD can be described as learning for sustainable development (Vare & Scott, 2007). Type two builds capacity to think critically and to evaluate sustainable development ideas and it explores the dilemmas, issues and contradictions which form part of sustainable living. Type two ESD can be summarised as learning as sustainable development (Vare & Scott, 2007) which Vare and Scott (2007) suggest is less prevalent than type one ESD. Nearly 30 years ago, Daniella Tilbury (1995) argued that sustainability should be foregrounded as part of environmental education, so that both human and environmental concerns such as justice, nature, consumerism and business were encapsulated in what she articulated as 'environmental education for sustainability' (EEFS). More recently and working with teachers and young people from across the UK, Dunlop et al. (2022) have used the term 'Education for Environmental Sustainability' (EfES) to foreground the vital role of education in bringing about the necessary societal change needed to achieve environmental sustainability. As Stevenson (2007) highlights, much thought and debate has been given to whether this emphasis on sustainability is one to be affirmed, with some like Tilbury (1995) viewing this positively (Huckle, 1999; Hopkins & McKeown, 2002) and others seeing this as unhelpful (Jickling, 1992; Dillon & Teamey, 2002). Some scholars point to the ambiguous and vague nature of ESD (e.g. Selby & Kagawa, 2010) which has unspecified ends and means which are open to interpretation. Kopnina (2020) argues that the focus on sustainable development in discourses about education and the environment has promoted a global economic model focused on growth and minimised ecological agendas and the voices and concerns of communities and species that are marginalised.

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More recently, there has been a shift away from using the term Education for Sustainable Development (ESD), with this term appearing in only 26 per cent of national policy documents (UNESCO, 2019). This shift has led to the disjointed development of climate change education (CCE) and ESD policies worldwide, and climate change is sometimes included as a topic of ESD, or it is considered separately in policy (Laessøe & Mochizuki, 2015). CCE is integrated as part of existing strategic frameworks for ESD in a range of regional and national policies including Manitoba, Canada, China, Costa Rica, Dominican Republic, and South Africa. However, in the case of China and South African this integration has not yet been translated into substantive national CCE initiatives (Laessøe & Mochizuki, 2015).

Since 2008, in some contexts, CCE and ESD policies have included more concrete action plans, programmes, and initiatives (for example, Chile, Dominican Republic, South Africa and Vietnam). However, there can be disjointed development of these two sets of policies. This includes Chile, Denmark, and the Philippines. For example, in Denmark, climate change policy includes initiatives to raise public awareness which are not connected to education policy making. Similarly, national climate change policy in the Philippines has led to CCE initiatives led by the Department for Education which are not integrated to wider ESD strategies (Laessøe & Mochizuki, 2015). In contrast, Vietnam has complementary development of climate change, CCE and ESD policies (Laessøe & Mochizuki, 2015).

Education in relation to Disaster Risk Reduction (DRRE) is incorporated into broader frameworks of ESD and CCE in Australia, Chile, Dominican Republic, South Africa, and Vietnam. Policies explicitly focusing on DRRE as a key driver of CCE are evident in Bangladesh, Philippines, and Tuvalu. However, in Bangladesh and Tuvalu, climate change policy is being developed in the absence of national ESD structures, potentially due to the prioritisation of Education for All (EFA) goals (Laessøe & Mochizuki, 2015). Finally, framings of the green economy and green skills are evident in policy making in Australia, China, England and South Korea (Laessøe & Mochizuki, 2015).

1.2.1 Terminology associated with climate change and sustainability in the context of education

As Eilam (2022) highlights, these shifts in policy are associated with the plethora of terms relating to climate change used in both the research literature and education-focused policy documents. Drawing on Eilam (2022), we have loosely categorised these varied terms into six broad areas (Table 1).



Overarching areas	Terms	Indicative literature
Citizenship Education	Citizenship Education	UNESCO (2021b)
	Civic Education	Kessler (2021)
	Global Citizenship Education (GCE)	UNESCO (2020)
Climate Change Education (CCE)	Carbon Literacy	DfE (2022) (UK)
	Climate Crisis	Ángel & Cartea (2020)
	Climate Change Education (CCE)	Rousell & Cutter-Mackenzie- Knowles (2020); Monroe et al. (2019)
	Climate Education (CE)	Bieler et al. (2017)
	Climate Literacy	U.S. Global Change Research Program (2009)
	Climate Science Literacy	Busch & Román (2017)
Development Education	Development Education	Blum et al. (2013)
	Education for Sustainable Development (ESD)	UNESCO (2021a&b)
Environmental Education (EE)	Ecological Education	Mulvik et al. (2022)
(Environmental Education (EE)	Mulvik et al. (2022)
Environmental Sustainability Education	Education for Environmental Sustainability (EfSE)	Dunlop et al. (2022)
	Education for Sustainability (EfS)	Mulvik et al. (2022)
	Environmental Sustainability Education (ESE)	Aikens & McKenzie (2021)
	Learning for Environmental Sustainability (LES)	European Commission (2022)
	Sustainability Education	European Commission (2022)
Other	Disaster Risk Reduction Education (DRRE)	UNESCO & UNICEF (2014)
	Global Education	European Commission (2022)
	Peace Education	European Commission (2022)

Table 1. The range of terms associated with climate change and sustainability in education policy and literature (developed from Eilam, 2022)

1.2.2 Overview of recent national climate change and sustainability education policies

Through a review of over 190 national curricula, published in both research and grey literature, Eilam (2022) analysed the place and framing of climate change education. In summary, Eilam's (2022) review highlighted that climate change is mentioned in the curricula of about 53 per cent of countries worldwide (UNESCO, 2021; 2021a). However, climate change is included in a superficial, fragmented, and dispersed way (Eilam, 2022). Furthermore, Eilam (2022) highlights that many curriculum documents do not include a clear rationale, or approaches to including climate change in school-based education. Consistent with the disjointed and disconnected inclusion of CCE and ESD in national policy as shown above, CCE is similarly inconsistently framed and included in curricula documents (Eilam, 2022). Most documents included in the review advocate cross-curricular approaches to climate change, however it is rarely taught in this way (Eilam, 2022; UNESCO, 2021;2021a). Where climate change is covered in depth, this principally occurs in science and geography during the middle school age phase (ages 11 to 15 years). For example, climate change is included as a standalone topic in Ontario, Canada in Year 10 science and in Indonesia in Year 7 science (Dawson et al., 2022). In New Jersey, climate change is a self-contained topic in both science and social studies (Eilam, 2022). Finally, consistent with research concerning climate change education and teacher professional development, the vast majority of national curricular documents and policies considered in the review conducted by Eilam (2022) were from anglophone contexts. Of twenty countries, six were from majority English-speaking nations (Australia, Canada, Ireland, New Zealand, UK & USA). which underlines the need for further research to ensure the insights and expertise from beyond these contexts is fully considered. Furthermore, Eilam's review (2022) includes only a passing mention of India and Zambia and Irag is not included at all, which underlines the importance of further understanding of climate change education in these nations.

Looking beyond the extensive review conducted by Eilam (2022), it is also important to consider the significant role which international non-governmental organisations play in enhancing climate change and sustainability education globally. This includes advocacy, thought leadership and facilitating and enabling partnerships which enable reciprocal learning. As the UNESCO (2021a) report, *Getting every school climate-ready*, underlined, sustained and significant international effort is needed. For example, less than half of one hundred national curriculum documents reviewed



included references to climate change and where climate change is included it is focused in countries who are more vulnerable to the impacts of climate change rather than those who have greatest responsibility for global emissions which cause climate change (UNESCO, 2021a). Furthermore, whilst teachers overwhelmingly support teaching about the severity and effects of climate change, only 40 per cent reported having the confidence to do so and one-third felt able to explain well the effects of climate change in their region (UNESCO, 2021a). One recent example of the ways in which international non-governmental organisations can support and enhance effective climate change and sustainability is UNESCO's Greening Education Partnership (UNESCO, n.d.). Drawing on the framework of Education for Sustainable Development, the Greening Education Partnership aims to support nations to ensure that 'every learner is climate ready' (UNESCO, n.d.). The Greening Education Partnership promotes action across four areas: schools, learning, capacity and readiness, and communities. Fundamental to this work is an holistic understanding of climate change and sustainability education as a life-long endeavour which encompasses knowledge and social and emotional awareness and actions. Countries are invited to commit to action across at least two of the four areas and to monitor progress towards clear goals set for 2023 which include:

- Greening schools all countries will have adopted a green school accreditation scheme with at least 50 per cent of schools, colleges, and universities with green accreditation and are operating sustainably.
- Greening learning the number of countries which include climate education in school curricula
 at the pre-primary, primary, and secondary levels will have at least doubled from the current
 ~45 per cent.
- Greening capacity and readiness all school leaders and at least one teacher per school will have been trained on how to integrate climate education into teaching and learning throughout the school.
- **Greening communities** all countries will be able to report at least three different ways learning opportunities are made available for adults outside the formal education system to develop the skills, attitudes, and actions that will foster community resilience to tackle climate change.

(UNESCO, n.d.)

As this example demonstrates, through partnership working, including sharing high-quality resources, monitoring and promoting engagement and action, international non-governmental organisations such as UNESCO and the British Council have a vital role to play in ensuring every school and learner accesses high-quality climate change and sustainability education.

We now consider further the ways in which national climate change education policy is variously implemented in national curriculum documents.

1.2.3 Varied implementation of CCE in national curriculum documents

As Eilam (2022) has highlighted, a country's national school curriculum is influential in shaping climate change education due to their statutory power, and climate change is predominantly included in **science and geography during the middle school** age phase. Even within these relatively narrow parameters of subject and age-phase, a study of six countries (Australia, Canada, England, Finland, Indonesia, and Israel) by Dawson et al. (2022) demonstrated that there is significant variation in implementation (Table 2).



Country	Approach to CCE in national curriculum
Australia	Climate change is not mandated and there are limited and implicit opportunities in science and geography.
Canada (Ontario)	Climate change is included in a compulsory unit for all Year 10 students which includes the causes and consequences of climate change and opportunities to identify ways to reduce climate change impacts.
England	Climate change has limited coverage in science and geography (Years 7–9) with a focus on the science of climate change; anthropogenic climate change is marginalised in geography.
Finland	Teachers have autonomy to incorporate climate change across all science subjects. Apart from geography and biology, the extent to which teachers explicitly explore climate change and sustainable futures in their teaching is at the discretion of the teacher and/or school.
Indonesia	Climate change, global warming, ecosystem impact and human causes and responses are included in a compulsory science unit for Year 7. The reliance on textbooks means that teaching is largely constrained to the science of global warming, including concepts such as the greenhouse effect.
Israel	Climate change and global warming are extensively and explicitly included in teaching resources and assessment items concerning geography and to a lesser extent science and technology. This is integrated through two overarching themes: sustainable development and environmental literacy.

Table 2. The inclusion of climate change in the national curriculum from six countries (developed from Dawson et al., 2022)

Having considered climate change education policy and implementation through national curricula, we consider in more detail the implementation of climate change and sustainability education in the four jurisdictions of the UK: England, Northern Ireland, Scotland and Wales.

1.2.4 Climate change and sustainability education in the UK

Since the 1990s, devolution of the home nations of the United Kingdom of Great Britain and Northern Ireland (UK) has meant that each jurisdiction has the authority to develop and govern their own public services. Consequently, England, Northern Ireland, Scotland and Wales determine their own education policy, including national curricula and assessments, and have their own accountability and inspection regimes (see Table 3). However, it should be noted that even prior to devolution, Scotland, Wales and Northern Ireland have educational contexts which are quite distinct from England.



	England	Northern Ireland	Scotland	Wales
Government department or directorate responsible	Department for Education (DfE)	Department of Education (DE)	Learning Directorate	Department for Education and Skills
Sets curriculum	Department for Education	Council for the Curriculum, Examinations & Assessment (CCEA)	Education Scotland/ Foghlam Alba (Scottish Government Executive Agency)	Department for Education and Skills
Qualification awarding bodies	AQA Edexcel (Pearson) OCR (regulated by Ofqual, a non- ministerial government department)	Council for the Curriculum, Examinations & Assessment (CCEA)	Scottish Qualifications Authority (SQA)	WJEC (regulated by Qualifications Wales, an independent statutory body funded by the Welsh Government)
Main qualification at school leaving age (usually 16)	GCSE	GCSE	National 5	GCSE
Inspectorate	Ofsted (Office for Standards in Education, Children's Services and Skills) is a non-ministerial department	Education and Training Inspectorate (within the Department of Education)	His Majesty's Inspectorate of Education (within Education Scotland)	Estyn (independent of Welsh Parliament but funded by Welsh government)

Table 3. Education in the UK (Dunlop et al., 2022)



In England, curriculum making continues to foreground subject knowledge (and the ability to retain this in long-term memory) in the curriculum (Parker & Leat, 2021). Whereas, in Northern Ireland, Scotland and Wales, the emphasis is on capacities. The focus on capacities in a 'new curriculum' model (Priestley & Biesta, 2013) means that learning outcomes have moved away from what students learn, to focus on what they should become (Biesta & Priestley, 2013, p.7). This shift towards capacities-focused curricula extends beyond the UK and includes Ireland (Dempsey et al., 2021), Australia and New Zealand (Biesta & Priestley, 2013). These different approaches to curriculum making and student learning are reflected in the ways climate change education is understood and enacted.

We now consider the inclusion of climate change and sustainability education in formal schooling in England, Northern Ireland, Scotland and Wales, with a focus on the national curricula of each context.

1.2.4.1 Climate change and sustainability education in England

In 1989, a national curriculum was first introduced in England. Today, in England, secondary science is compulsory for students aged 11–16 years, and geography is compulsory for ages 11–14 and then optional for students aged 14+ years. Over the last 30 years, curriculum specification in all subjects has reduced considerably in England, with a major revision of the national curriculum in 1995 to give schools greater autonomy in how they implement and enact the curriculum (Parker & Leat, 2021). However, this has been coupled with an 'intense focus' on national exams and international test results which some have argued significantly reduce teacher autonomy (Parker & Leat, 2021). In 2019, Ofsted, the school inspectorate in England, published a new inspection framework for schools which emphasised the importance of subject knowledge and the way subject teaching is underpinned by and realises curriculum intent, implementation and impact (Parker & Leat, 2021). This is significant because it articulates a particular conception of the school curriculum as Parker and Leat (2021, p.154) describe:

Intent requires schools to offer a rich and varied curriculum, going beyond test requirements, *implementation* requires a strong focus on subjects and subject knowledge but with strong elements of discussion and engagement, while *impact* requires that knowledge is retained in long term memory with an effect too on behaviour and attitude.

The new inspection framework also has an increased focus on the 'whole person', in a new section called 'Personal Development'. This section highlights that the curriculum should enable children and young people to discover talents and interests, develop resilience and character, be responsible citizens and maintain physical and mental health (Ofsted, 2019). However, as Parker and Leat (2021, p.154) highlight, inspectors only comment on provision of 'Personal Development', they do not consider the impact which means this aspect has, 'less leverage than subject knowledge and its retention in memory, which is explicitly referred to as cultural capital'.

Howard-Jones et al. (2021) have highlighted that climate change was first included in the science national curriculum in 1995. However, in 2013, in response to suggestions of insufficient coverage of climate change, the Department for Education published a document which outlined the areas in both the science and geography curricula (for students aged 5–16 years) where climate change should be addressed (Howard-Jones et al., 2021; Eilam, 2022). Recent considerations of the science curriculum show that it includes the anthropogenic causes and effects of climate change and mitigation, and the geography curriculum explores human impacts on changing landscapes, environments, and climate (Howard-Jones et al., 2021; Dawson et al., 2022). However, the broader socio-economic impacts of climate change are not considered, and neither are there substantive opportunities to address action, behaviour change and social justice (Howard-Jones et al., 2021; Dawson et al., 2022). Researchers have argued that the framing of climate change and environmental education in England is focused on learning about the environment, rather than learning for the environment (Glackin & King, 2020; Dunlop & Rushton, 2022; Greer et al., 2023). This is potentially problematic as research consistently underscores the need for climate change and sustainability education to encompass more than knowledge gain and enable people to engage with affective dimensions (Höhle & Bengtsson, 2023). Failure to do so can lead to increased feelings of helplessness and hopelessness, increasing climate anxiety and apathy (Ojala 2012, 2012a, 2013, 2015). As we have seen above, Ofsted's focus on curriculum intent, implementation and impact has the potential to consider the ways in which the school curriculum

shapes the behaviours and attitudes of children and young people, including in relation to climate change and sustainability.

In April 2022, the Department for Education published a strategy for sustainability and climate change for education and children's services systems in England (DfE, 2022) which represents a substantial intervention. The strategy identified five '**action areas**' (DfE, 2022):

- Climate Education
- Green Skills and Careers
- · Education Estate and Digital Infrastructure
- · Operations and Supply Chains
- International.

Three initiatives are driving the strategy: The National Education Nature Park; the Climate Action Award; and Sustainability Leadership. For each action area, goals are set which extend until 2030 (DfE, 2022). The National Education Nature Park initiative is led by the Natural History Museum and brings together a network of outdoor spaces in education settings across England. Through the scheme, education settings will have access to free learning resources and the opportunity to participate in community science projects. Young people will be equipped with the resources and skills to map, monitor and enhance the biodiversity of their school sites (Natural History Museum, 2023). In May 2023, the DfE announced that, from autumn 2023, grants worth a total of £15 million would be available for schools in 'deprived' and 'nature depleted' areas to further support actions which enhance biodiversity on school grounds (DfE, 2023). This could include purchasing equipment to support outdoor learning and teaching and increase access to learning in outdoor spaces for children and young people with additional learning needs.

The second initiative, the Climate Action Award (initially it was named the Climate Leaders Award) will 'recognise and celebrate places of education that support their students in developing green skills, championing nature and working towards a sustainable future' (Natural History Museum, 2023). The award will have **four levels** (Natural History Museum, 2023):

- · Raising awareness
- Gaining knowledge and/or investigating
- · Carrying out research in partnership
- Problem solving, researching a local issue in a sustained partnership.

As of August 2023, these two initiatives are in a pilot phase with national implementation planned during autumn 2023.

The third initiative is Sustainability Leadership. The strategy states: 'by 2025, all education settings will have nominated a sustainability lead and put in place a climate action plan'. Non-statutory guidance has been published as a first step to support settings and as of August 2023, work is in progress to contract partners for the delivery of a digital hub and regional engagement and support service. This initiative is designed to ensure that all education settings can take a holistic, evidence-based approach to responding to climate change. In addition, DfE will aim to introduce a new GCSE qualification in natural history by 2025. This will give young people a further opportunity to engage with and develop a deeper knowledge and understanding of the natural world. Resources are being developed to support science teachers' continuing professional development (CPD) to ensure that all young people receive high-quality teaching on the scientific facts about climate change and environmental degradation.

The approach in England is to support existing opportunities for the teaching of climate change and sustainability, rather than to implement changes to the national curriculum and, through the new strategy, provide further opportunities and support for all education settings to engage in climate change and sustainability education within and beyond the classroom.

1.2.4.2 Climate change and sustainability education in Northern Ireland

The Department of Education (DE) is a devolved government department in the Northern Ireland Executive, with responsibility for school phase education including pre-school, primary, postprimary and special education. In addition, the DE is responsible for youth policy, community relations within and between schools, and teacher education and salaries whereas Higher Education is the responsibility of the Department of the Economy (NIEL, 2021). The DE has an overall vision to 'ensure that every learner fulfils her or his potential at each stage of development' across the following: raising standards for all: closing the performance gap, increasing access and equality: developing the education workforce; improving the learning environment; and transforming education management (NIEL, 2021, p.12). Key functions of the DE include advising on education policy, framing legislation, accounting for the effectiveness of the education system, allocating, monitoring and accounting for resources. The Education and Training Inspectorate (ETI) evaluates and reports on the quality of teaching and learning and teacher education. Administration of the education system is delegated to a single combined authority, funded by the department that is the Education Authority (EA) (NIEL, 2021). The EA is a regional body with responsibility for the provision and delivery of education and youth services and has a statutory duty to deliver and implement strategies related to the education system.

As Dunlop and Rushton (2022) note, in Northern Ireland, the Council for the Curriculum, Examinations, and Assessment (2020) includes the environment and sustainability in the objectives, key elements and areas of learning in the statutory curriculum, specifically in the objective 'to develop the young person as a contributor to the economy and the environment', the key element 'education for sustainable development' and through the area of learning 'environment and society'. Teachers have considerable freedom to determine how they teach these key elements to meet objectives, with examples of how this can be achieved across the curriculum outlined in the Education (Curriculum Minimum Content) Order (Northern Ireland) 2007 (DE, 2007).

In May 2021, the Northern Ireland Environment Link (NIEL) published a new strategy and action plan for Education for Sustainability (EfS). NIEL is a collective body for environmental groups and charities in Northern Ireland. The strategy and action plan for EfS underlines the need for education to 'focus more on understanding complexity, empathy and self/mutual understanding through transdisciplinary perspectives so that we can meet the future more sustainably' (NIEL, 2021 p.7). Quality EfS is defined in the action plan and strategy as requiring three elements for success (NIEL, 2021 p.7):

• Education about sustainability ensures learners develop knowledge and understanding about the environment and sustainable development, beginning with local, and extending to an understanding of wider global issues.

- Education delivered through sustainable practice allows children and young people to experience sustainability as modelled around them in school curriculum, culture, community and campus, and is reflected in both ethos and policies.
- Education for sustainability develops positive attitudes and behaviours towards the environment and sustainable development alongside action and advocacy for wider change.

In 2022, the DE approved a new coursework-based GCSE equivalent qualification called Reducing Carbon Footprints Through Environmental Action, awarded by the Open College Network, Northern Ireland (OCN, NI). This new course includes topics such as understanding the role of carbon in climate change, single-use plastics, fast fashion and climate action.

1.2.4.3 Climate change and sustainability education in Scotland

The importance of climate change and environmental concerns for young people in Scotland has been emphasised in a recent report, 'All Learners Matter' which captures a 'National Discussion', commissioned by the Scottish Government (Campbell & Harris, 2023). This National Discussion sought to respond to the question, What kind of education will be needed by children and young people in Scotland in the future and how do we make that a reality? (Campbell & Harris, 2023). The National Discussion involved responses gathered between September and December 2022, from over 38,000 people (including 26,000 primary and secondary students) representing early years organisations, schools, other education organisations, community groups, third sector organisations, youth workers, parents' groups, education professional organisations, local authorities, and policy makers. These were provided in a range of ways, such as online and in-person discussion events, responses to an online survey, responses provided through in-school facilitated discussions and written contributions provided by a range of institutions and groups. The report outlines 'A Call to Action' and this includes a strong emphasis on the importance of climate change and the environment for children and young people:

Issues of climate change and global warming were at the heart of many of the discussions we heard. The environment that children and young people will inherit is clearly of major and pressing concern. We heard a great deal of passion from the children and young people we spoke to about saving the planet, climate change, and upholding their rights. We also heard fears and anxieties, from them, about living in a world that is dramatically changing and evolving.

(Campbell & Harris, 2023, pp.21–22)

This is a strong statement of the importance of climate change and environmental concern to children and young people, which provides an important context through which to consider the ways in which the Scottish curriculum responds to these concerns.

Nearly two decades ago, in 2004, Scotland launched Curriculum for Excellence (CfE) (Scottish Executive, 2004). This is an early example of a 'new curriculum' model (Priestley & Biesta, 2013) which focuses on capabilities or capacities, in this case: successful learners, confident individuals, effective contributors and confident citizens (Scottish Executive, 2004; Hulme & Priestley, 2021). The curriculum frames learning across four contexts including subject areas, the life and ethos of the school, interdisciplinary learning opportunities and opportunities for personal achievement. This is a broad conceptualisation of curriculum that goes beyond curriculum as an official text authorised by a government. Hulme and Priestley (2021) summarise the key features of CfE as including increased emphasis on generic skills and reduced focused on propositional knowledge where learning is understood as a linear framework of experiences and outcomes, foregrounding active, student-centred pedagogies and understanding teachers as curriculum makers. Nearly 20 years on, the implementation of CfE has not been without challenge or criticism. Challenges in implementation include the proliferation of guidance documents without a single framework for the curriculum, which led to complexity and confusion for teachers as the key concepts about learning shifted over a series of guidance published between 2006 and 2011 (Hulme & Priestley, 2021). CfE also included reforms to qualifications, which were announced in 2009.

Arguably, a key unintended consequence of these reforms to qualifications has been the reduction of subject choice in the later phase of secondary school and, in many schools, CfE has been framed as the implementation of new qualifications rather than a much broader project of curriculum reform (Hulme and Priestley, 2021). Education policy reform is inherently complex and Hulme & Priestley (2021) have argued that CfE is an example of the implementation gap. However, they also note how CfE reforms have meant the concept of curriculum has 're-entered professional discourse in a more systematic way...there is a sense that meaningful curriculum making is back on the menu in Scottish schools and this may bode well for the future development of CfE' (p.193). CfE was included as part of the 'National Discussion' regarding the future of Scottish education outlined at the beginning of this section (Campbell & Harris, 2023). In their report, Campbell and Harris (2023) highlight that the four capacities of CfE (successful learners, confident individuals, effective contributors, confident citizens) are understood as a strength of the curriculum and should be regularly reviewed to ensure it is still fit for purpose.

Unlike England, Scotland has integrated sustainability into formal education for a decade through the framework, 'Learning for Sustainability (LfS). LfS combines: Education for Global Citizenship (ECG), Outdoor Learning, Children's Rights and Sustainable Development Education (SDE) into a set of guidelines. The Learning for Sustainability National Implementation Group (2016, p.7) describes LfS as:

...enabl[ing] learners, educators, schools and their wider communities to build a sociallyjust, sustainable and equitable society. An effective whole school and community approach to LfS weaves together global citizenship, sustainable development education, outdoor learning and children's rights to create coherent, rewarding and transformative learning experiences.

As McGregor and Christie (2021) note, this educational policy requires that all learners have an entitlement to LfS and that all teachers and education professionals address LfS in their practice. Since 2013, LfS guidance has been integrated into the standards for teachers during their initial education, career-long professional development and in leadership and management and all teachers in Scotland are required to include LfS in their practice (Clarke & Mcphie, 2016). Similarly, the General Teaching Council for Scotland (GTCS), which validates teacher education programmes in Scotland, has incorporated LfS into this validation process (Clarke & McPhie, 2016). In the Professional Standards for teachers, the GTCS (GTCS, 2021, p.3) underline that they:

...actively support, embrace and promote the principles and practices of sustainability across all aspects. This means understanding and valuing the environment, culture and heritage, developing a sense of place and belonging to the local, national and global community. It also means having a deep connection to the natural world and understanding the significance of the choices we make – now and in the future.

LfS articulates an holistic approach which 'encourages educators and learners to engage with complexity, messiness and uncertainty in ongoing open-ended pedagogical endeavour' (Gregor & McChristie, 2021 p.2). A recent report which explored measuring quality in ITE in Scotland (Kennedy et al., 2023, p.44) noted the ways in which teachers who are new to the profession are supported during their ITE phase to 'embrace Learning for Sustainability and social justice', which is an indicator of the strength of this approach in this phase of teacher education and professional development.

1.2.4.4 Climate change and sustainability education in Wales

Following the publication of the 'Successful Futures' report (Donaldson, 2015), education policy in Wales has seen significant change in approach with a stronger focus on learner outcomes through interdisciplinary and experiential education, another example of a 'new curriculum' model (Priestley & Biesta, 2013). Curriculum for Wales became statutory in September 2022 and is formed around '**four purposes**' (Welsh Government, 2021; 2021a) which enable every child and young person to become:



- · Ambitious, capable learners, ready to learn throughout their lives
- Enterprising, creative contributors, ready to play a full part in life and work
- · Ethical, and informed citizens of Wales and the world
- · Healthy, confident individuals, ready to lead fulfilling lives as valued members of society.

This has resulted in substantial changes in curriculum design for students aged 3–16 years in schools in Wales as the Curriculum for Wales has moved away from organising curricula around traditional disciplinary subjects and has replaced this with six **Areas of Learning Experience** (AoLE), which encompass a range of subjects:

- Expressive Arts
- Health and well-being
- · Humanities
- · Languages, literacy and communication
- Mathematics and numeracy
- Science and technology.

This period of curriculum reform includes the ways in which climate change education features in the formal curriculum in Wales. However, the broader field of Education for Sustainable Development and Global Citizenship (ESDGC) has long been recognised as a priority for the Welsh government, as reflected in the school inspection framework and guidance available to aid schools with ESDGC (Welsh Assembly Government, 2008). In the former curriculum, climate change was explicitly included in the ESDGC guidance along with wider environmental themes of consumption and waste and the natural environment as part of science and geography (Jones, 2023). In the new curriculum (Welsh Government, 2021a), climate change education features in the 'what matters' code upon which schools must base their curriculum, for example, by ensuring 'informed, self-aware citizens engage with the challenges and opportunities that face humanity and are able to take considered and ethical action' (p.10). As Jones (2023) has highlighted, environmental education, including climate change, is now embedded through the combination of Science as an AoLE, coupled with the core purpose of developing ethical citizenship. This approach combines both knowledge, skills and reflection on behaviour and/or behaviour change within the curriculum consistent with what is widely understood as effective contemporary approaches to climate change education (Jones, 2023).

In the section which follows, we continue to explore what constitutes effective climate change and sustainability education through a review of the research literature. Having considered climate change and sustainability education through the implementation of international policy and national curricula, including the four jurisdictions of the UK, we now explore conceptualisations of schoolbased CCSE as identified through systematic reviews of the research literature.

1.3 Climate change and sustainability education as part of school education

Climate change education has been described as a 'hyper-complex' concept (Læssøe et al., 2009) that brings two independently complex concepts of 'education' and 'climate change' together and, as has been outlined above, 'sustainability' has been variously conceptualised in the context of education. Concomitantly, the importance of education as a fundamental part of the response to global climate and environmental crises has been underlined by the recent joint statement of the education and environment ministers at COP26 (UNFCCC, 2021). Across the literature there is wide variation in what is understood as the most appropriate and effective climate change education pedagogy and curriculum across regions and countries, between schools and across disciplines. To provide a broad overview of formal climate change education in the research literature, we draw on three recent systematic reviews which combined considered over 320 items of research focused on climate change education, published during 1993–2020 (Monroe et al., 2019; Rousell & Cutter-Mackenzie-Knowles, 2020; Trott et al., 2023). In addition, we draw on the review of Taylor et al. (2019), which considered over 70 items of research focused on sustainability education in secondary schools during 2010–2019 and the review of Holst (2023), which explored whole school approaches to sustainability education in over 100 items of research published before December 2020.

1.3.1 Effective climate change and sustainability education programmes

Through a systematic review, Monroe et al. (2019) considered studies which explored the efficacy of climate change strategies across 49 items of research. This review found that most articles focused on improving students' knowledge about climate change, including assessing increased understanding about climate science or the causes of and solutions to climate change (40 studies) and that formal education in schools was the predominant context (28 studies). Two overarching strategies which increased the success of climate change education programmes included (1) focusing on personally relevant and meaningful climate change information (not enough to simply link climate change to impact on humans, need to make specific links to the relevance of learners' lives) and (2) using student-centred, active and engaging teaching methods (Monroe et al., 2019). Examples of active and engaging teaching methods included role-play, the use of visual imagery and inquiry-based activities such as student investigations.

Alongside these two overarching strategies, Monroe et al. (2019) identified four themes specific to teaching climate change where learners were supported to move beyond understanding the basics of climate science: (1) the use of deliberative discussion to enable students to better understand their own and others' viewpoints and knowledge about climate change; (2) opportunities for students to interact with scientists and to experience the scientific process for themselves; (3) designing teaching and learning so that it explicitly highlights and responds to misconceptions about climate change; and, (4) designing and implementing school or community projects which address an aspect of climate change. Monroe et al. (2019) noted that very few of the climate change education programmes which they reviewed were considered consistent with the goal for climate change education identified by Kagawa and Selby (2010, p.4): 'to think about what really and profoundly matters, to collectively envision a better future, and then to become practical visionaries in realising that future.' Furthermore, few programmes were grounded in multidisciplinary, interdisciplinary or transdisciplinary approaches to climate change education.

Rousell and Cutter-Mackenzie-Knowles (2020) identified 220 climate change education focused items published during the period 1993–2014 as part of a survey of climate change education research. Unlike the review of Monroe et al. (2019) which focused solely on research literature (48 research articles, 1 book chapter), the survey undertaken by Rousell and Cutter-Mackenzie-Knowles (2020) was broader and encompassed published reports and literature from studies which extended beyond the formal school classroom. Rousell and Cutter-Mackenzie-Knowles (2020) found that the majority of the publications had a STEM (Science, Technology, Engineering and Mathematics) disciplinary focus (over 70 studies) and most of these were associated with formal education (curriculum and pedagogy) in school and university settings. Across the items included in the survey, there was a strong emphasis on scientific knowledge-based approaches to climate change education, with nearly half of all publications specifically referring to scientific knowledge as the primary framing of climate change education (Rousell & Cutter-Mackenzie-Knowles, 2020). The dominance of top-down, science-based approaches in formal educational settings is challenged in literature included in the review, and a key area of disagreement is the extent to which increased knowledge of climate science should be the primary goal of climate change education rather than 'interdisciplinary, affect-driven and experiential approaches' to school-based climate change education (Rousell & Cutter-Mackenzie-Knowles, 2020, p.196).

Consistent with Monroe et al. (2019), Rousell and Cutter-Mackenzie-Knowles (2020) draw on Kagawa and Selby's (2010) broader conceptualisations of the purpose of climate change education which empower children and young people to collectively envision and practically realise a better future. To achieve this, Rousell and Cutter-Mackenzie-Knowles (2020, p.203) argue that:

Climate change education needs to draw on participatory and creative approaches from multiple disciplines in establishing itself as distinct from both science education and environmental education. The scientific, social, ethical, and political complexities of climate change call for such an approach, which empowers children and young people to meaningfully engage with entanglements of climate fact, value, power, and concern across multiple scales and temporalities. This requires the development of new modes of climate change education which are open to radical and visionary alternative for the future.

Both the systematic reviews of Monroe et al. (2019) and Rousell and Cutter-Mackenzie-Knowles (2020) underline the importance of moving beyond learning about the facts of climate change in the context of formal science education and embracing multi-disciplinary climate change education which draws on varied pedagogies which are student-centred, relevant, and meaningful and enable students to grapple with their role within the multi-faceted complexities of responding to climate change. This is consistent with the literature which explores effective sustainability education. For example, Holst (2023, p.1015) outlines that whole-school approaches can be both 'an instrument for consistent organisational development...and as a keystone of integrated high-quality sustainability learning'. Whole-school approaches include five core principles: coherence, continuous learning, participation, responsibility and long-term commitment (Holst, 2023). These principles are coupled with seven areas of action which themselves are integrated, including: governance, curriculum, campus, community, research, communication and capacity building (Holst, 2023). Similarly, Taylor et al. (2019) underline that effective sustainability education is more likely to be achieved in schools, especially in secondary contexts through the following approaches: (1) collective effort by an entire education sector which is united by a formal framework and commitment, (2) sustainability education includes and values non-formal approaches and teachers are rewarded for implementing this approach with accreditation and/or external recognition, (3) teachers are supported to integrate sustainability through teaching of the national curriculum, (4) schools have access to (electronic) networks which share ideas and resources, engage with the research community and provide ongoing support (Taylor et al., 2019). These broad understandings of approaches which support effective sustainability education are especially helpful when reflecting on the challenges schools encounter regarding climate change and sustainability education and we will return to these in Section 1.5.

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1.3.2 Justice-driven climate change education

In a third and most recent systematic review, Trott et al. (2023) considered 55 articles published during 2007–2020 which had a focus on justice-driven climate change education. Justice was predominantly found to be a theoretical framework or rationale for climate change education programmes and less an explicit content focus (e.g., for education activities) (Trott et al., 2023). Justice-driven climate change education took place within and beyond STEM education settings, included learners of all ages and was founded across formal and community-based contexts (Trott et al., 2023). Some common school subjects were absent from studies considered in the review, for example English language and literature, and the arts. Across the review, justice-driven climate change education was 'fuelled more by people-focused aims (e.g., advancing equity) compared to planet-focused aims (e.g., protecting the environment)' (Trott et al., 2023, p.1). Finally, only a small number of studies included clearly defined opportunities for action, and that where action was present it was likely to take place at the neighbourhood or community levels with the aim of enacting system-level change in response to future harms associated with climate change (Trott et al., 2023).

Across all three systematic reviews of climate change education, the authors highlight a range of opportunities to enhance and develop school-based climate change education, which are grounded in broader conceptualisations of the purpose of climate change education that extend beyond learning the scientific facts about climate change and instead empower students to enact the system-level change which is required to meaningfully respond to climate-altered futures. Tensions persist concerning the extent to which climate change education will be developed so that this broader purpose can be realised beyond the current 'pockets of hope and possibility' (Joseph-Salisbury & Connelly, 2021) and instead become an integral part of every child and young person's experience of climate change education.

It is widely understood that the quality of teaching that children and young people receive is a key determining factor in student outcomes. Teacher education and continuous professional development are important spaces for teachers to engage in professional learning that includes subject-specialist and age-phase expertise. Therefore, ensuring that all teachers can engage in climate change and sustainability focused learning over the course of their professional lives is a vital part of realising education's role, as part of the large-scale change project needed to respond to the impacts of climate change.

In what follows, we explore research literature focused on climate change education and teacher professional development.

1.3.3 Climate change and sustainability education and teacher professional development

Research shows that teachers find ways to integrate climate change and sustainability into their existing practice regardless of, and sometimes despite, formal policy directives (Wise, 2010; Álvarez-García et al., 2015; Colston & Ivey, 2015; Drewes, et al., 2018; Dunlop & Rushton, 2022). However, providing access to high-quality teacher professional development is a key mechanism in enhancing school-based climate change and sustainability education. For example, in a study of over 600 educators based in the US (including classroom teachers and those working in informal education settings), Li et al. (2021) found that effective climate change professional development combined pedagogical content knowledge with strategies to build educators' self-efficacy. This combination was particularly important when teaching topics which are complex and understood as contentious, and was especially beneficial for those new to teaching climate change. Li et al. (2021) argued that if you are to build educators' confidence, programmes need to increase subject matter knowledge through pedagogical content knowledge, 'since pedagogy changes across content areas' and, that it should not be assumed that educators already know 'effective pedagogy to translate that new information to their students' (p.34).

In contrast, in a study involving over 50 US-based science teachers, Ennes et al. (2021) explored why teachers did not participate in a climate change focused professional development programme. The most significant barrier reported was insufficient time to participate, rather than the nature of the topic, access to teacher professional development opportunities, or teacher confidence. Rather

than developing bespoke strategies for climate change-focused teacher professional development, Ennes et al. (2021) advocate that efforts should be directed at providing teachers with sufficient time to engage with professional development opportunities. Finally, in a further study of US-based science teachers, Drewes et al. (2018) underline the need for teacher professional development programmes to be flexible so that they enable teachers varied opportunities to translate specific climate change concepts into their local practice. Consistent with climate change education that affords students with opportunities to engage in personally relevant and meaningful climate change information (Monroe et al., 2019), teachers also need opportunities to make sense of how new content knowledge relates to both curricular requirements and teachers' professional lives (Drewes et al., 2018).

Researchers also point to the importance of climate change education which enables teachers (as well as students) to move beyond the acquisition of knowledge about climate change (Drewes et al., 2018; Dunlop et al., 2022) and instead develop a 'local, personal, and often emotional connection on a pathway to social activism' (Drewes et al., 2018, p.83). Drewes et al. (2018) highlight the need for future conceptual and empirical investigation which considers how best to prepare teachers to 'move toward scientifically informed social action in science education classrooms?' (p.83). We underline that this question is not only limited to science educators but to education in general. Looking beyond the UK and the US, in a study which drew on teacher and student insights from Zambia, Mubanga et al. (2022) note that whilst more than half of the secondary school teachers who responded identified that they taught aspects of climate change within their subjects, threeguarters of teachers had not had any previous training related to teaching climate change and those who had accessed this through workshops and seminars rather than as part of their tertiary education. To address this, Mubanga et al. (2022) suggest the government make climate change education a compulsory part of secondary school and initial teacher education programmes. In a small-scale study of teachers from Irag, Rushton & Greer (2023) also found that teachers valued, but currently lacked, access to climate change-related teacher professional development and teachers also emphasised the need for schools to access up-to-date information and resources which were evaluated by teachers, to ensure that they have a positive impact on teachers' practice.

These insights as to effective approaches to climate change-focused teacher professional development are consistent with studies which consider sustainability education and teacher professional development. Evans et al. (2017) reviewed 28 research items published during 1993–2012 and identified four main approaches, including: (1) embedding sustainability education widely across curriculum areas, courses, and institution; (2) through a dedicated compulsory subject; (3) through a component of a compulsory subject; and (4) through a dedicated optional subject. Evans et al. (2017) highlight that sustainability-focused teacher professional development remains an emerging area of research and pedagogy which is underpinned by a range of strategies which are frequently uncritically applied. Furthermore, the research base is generally descriptive, would benefit from further theorisation and is predominantly developed in Australia, the US and Europe. The previous studies of climate change education and teacher professional development from Zambia and Iraq notwithstanding, we highlight that the vast majority of research concerning climate change and sustainability education and teacher professional development is from anglophone and/ or science education contexts, with the US dominating the literature (Eilam, 2022; Evans et al., 2017; Puttick & Talks, 2021). Therefore, insights from a broad range of cultural and disciplinary contexts are needed to ensure effective and meaningful programmes are developed.

Having explored what is understood as effective climate change and sustainability education and teacher professional development, we now consider examples of good practice in school-based climate change and sustainability education.



1.4 Four approaches to school-based climate change and sustainability education

1.4.1 Whole-school approaches to climate change and sustainability education

As has been outlined above in the academic literature (e.g. Holst, 2023), whole-school approaches are recognised as valuable in bringing about change through education in the context of climate change and sustainability. Similarly, international non-governmental initiatives such as the Green Education Partnership (UNESCO, 2021a) advocate an approach which encompasses the four areas of schools, learning, capacity and resilience, and communities. Looking to England, the National Association of Environmental Education (NAEE) highlights a whole-school approach to climate change and sustainability education as encompassing all aspects of school life, including management (Lee & Scott, 2020). In guidance developed for school governing bodies, Lee and Scott (2020) divide this into four areas:

- Curriculum: across all opportunities for teaching and learning.
- · Campus: including buildings, grounds, operations, policies and budget.
- **Community**: leadership, work with families and wider community, engagement with external groups at local, regional and national scale.
- Culture: inclusion, values, care and respect.

The guidance underlines the important role for school governors in this space, as 'they are in a unique position to help schools develop students' awareness of sustainability issues and nurture their abilities to think critically about them and take responsibility for their actions in relation to them' (Lee & Scott, 2020, p.1).

The recent British Educational Research Association (BERA)'s manifesto for Education for Environmental Sustainability (EfES) (BERA, 2021; Dunlop et al., 2022), co-created by over two hundred teachers and young people, also draws on a whole-school approach to climate change and sustainability education. The Manifesto identifies four levels for EfES including the **classroom**, the **school**, **communities** and **policy**. Consistent with NAEE (2020), the manifesto foregrounds the important role of the 'campus' as a context for climate change and sustainability education, including through acknowledging and nurturing the link between the quality of the school environment and mental and physical health; considering environmental sustainability in all purchasing decisions where sustainability actions are tracked and rewarded (BERA, 2021). The BERA manifesto (2021) also underlines the important role for school governors and leaders in bringing about change as it advocates identifying ways to feature sustainability in school-level decision making bodies and polices and appointing and empowering a school sustainability lead. 33

Looking more specifically to the Scottish context, the Learning for Sustainability Action Plan (Education Scotland, 2019, p.1) states:

Learning for Sustainability (LfS) is a cross-curricular approach which enables learners, educators, schools and their wider communities to build a socially-just, sustainable and equitable society. An effective whole-school and community approach to LfS weaves together global citizenship, sustainable development education and outdoor learning to create coherent, rewarding and transformative learning experiences.

The LfS Action Plan (Education Scotland, 2019) includes five strategic objectives, two of which explicitly state the whole-school and community approach which underpins LfS:

- Every school should have a whole-school approach to Learning for Sustainability that is robust, demonstrable, evaluated and supported by leadership at all levels.
- · All school buildings, grounds and policies should support Learning for Sustainability

Examples of the different ways in which schools have incorporated LfS, including a selfevaluation and improvement framework are provided through Education Scotland's online National Improvement Hub. Recent research from England (Gillow et al., 2022), has indicated that whilst many headteachers are broadly supportive of climate change and sustainability education, their priorities tend to rest elsewhere, particularly post-pandemic, and in the context of severe financial restraint on school budgets. Harnessing the knowledge of the school community and the diverse expertise which governing bodies bring offers potential leadership capacity within schools, such that the responsibility for climate change and sustainability education can extend beyond individual teachers and school leaders. Furthermore, the use of the school site and contexts and resources of the wider community is an important part of implementing effective climate change education that is personally relevant and meaningful for children and young people and includes school or community-based projects (Monore et al., 2019; Cutter-Mackenzie-Knowles, 2020).

An important avenue to enhance climate change and sustainability education through formal schooling, which can involve wider members of the school community (including school governors) is through the provision of extracurricular activities. In the context of climate change and sustainability education, extra-curricular activities can be understood as those which occur outside or beyond the formal curriculum. These activities frequently take place on school sites and occur outside of classroom time, be that during lunch breaks or as part of an extended school day. They can include talks or presentations from visiting speakers, day or residential trips, environmental or climate change clubs for students, or small-scale inquiry or research projects organised by teachers for students (Rushton & Batchelder, 2019). Extra-curricular activities frequently draw on pedagogies which are well-suited to climate change and sustainability education such as interdisciplinary learning, foregrounding student decision making, and real-world practical activities which do not include assessment. Such activities provide valuable opportunities for school-based teaching and learning (Rushton & Batchelder, 2019) and, most crucially, they foster student agency to participate in ongoing climate change and environment-focused action and citizenship (Rushton & Batchelder, 2019). Roussell and Cutter-Mackenzie-Knowles (2020, p.191) highlight the need for 'participatory, interdisciplinary, creative and affect-driven' approaches to climate change education. They argue that these sorts of approaches are important because they enable children and young people to 'respond to the scientific, social, ethical and political complexities of climate change' (Rousell & Cutter-Mackenzie-Knowles, 2020, p.191). Operating beyond the constraints of the formal curriculum, extra-curricular activities are spaces which allow for flexibility and creativity to experiment with such pedagogies and to meet students' needs. Having considered the importance of the whole-school approach and the place of extra-curricular activities within this, we now explore the role of school-based citizen science projects which can be implemented as part of both curricula and extra-curricular activities.

1.4.2 Climate action focused citizen science projects

Citizen science – projects which involve members of the public in research science (Curtis, 2015) – have expanded rapidly over the past two decades, and a range of approaches to involve the public in science research have been described in the literature (Bonney et al., 2009; Bonney et al., 2016). Citizen science projects can be categorised by activity type, including: (1) data collection, (2) data processing, (3) curriculum-based, and (4) community science (Bonney al., 2016). There is growing evidence that participation in citizen science projects can develop both scientific knowledge and public understanding of scientific research, including in the domain of environmental education (Bonney et al., 2016; Rushton, 2019). For example, citizen science can simultaneously support science learning whilst at the same time increase pro-environmental attitudes and behaviours (Makuch & Aczel, 2018; Varaden et al., 2021). Ballard et al. (2017, p.65) suggest that citizen science projects can 'foster youth participation in current conservation actions and build their capacity for future conservation actions'.

Developing and implementing citizen science projects which have purposeful scientific and educational outcomes is a significant endeavour. However, researchers have demonstrated that citizen science has significant potential to enhance school-based science and environmental education (Shah & Martinez, 2016; Rushton, 2019; Rushton & Parker, 2019), including in extracurricular settings (Rushton & Batchelder, 2019). Citizen science projects are increasingly implemented in school settings with children and young people aged 5-18 years old (Rushton & Parker, 2019). The purpose and aims of school-based citizen science programmes can be broadly grouped as follows: (1) programmes which aim to increase scientific literacy, (2) programmes which aim to increase student motivation and engagement with scientific inquiry, (3) programmes which increase attainment and retention in STEM (science, technology, engineering and mathematics) subjects, and (4) programmes which aim to promote positive attitudes towards science-based careers (Rushton & Parker, 2019). School-based citizen science projects frequently provide opportunities for teachers and students to engage with a range of external partners including universities, industry partners and learned societies (Batchelder et al., 2023). Research has also underlined the benefits of these interactions for teachers as well as students (Rushton & Reiss, 2019; Rushton, 2021). However, Calabrese Barton (2012) asks whether 'citizen science' should be reframed as 'citizens' science', placing greater importance on science expertise that is linked to societal change which is located in a specific community. Furthermore, Calabrese Barton (2012) has guestioned the extent to which schools have the capacity to implement citizen science which brings about social change. However, citizen science projects frequently provide opportunities for children and young people to interact with scientists and experience the scientific process for themselves, which Monroe et al. (2019) have identified as a feature of effective climate change education.

In England, the new DfE strategy for climate change and sustainability (DfE, 2022) includes the 'Climate Action Awards' initiative, which will 'recognise and celebrate places of education that support their students in developing green skills, championing nature and working towards a sustainable future' (Natural History Museum, 2023). The awards are structured across four levels, as follows:

- Level 1 Raising awareness of climate and biodiversity loss issues, which could include crosscurricular approaches with opportunities for students to discuss nature.
- Level 2 Gaining knowledge and/or investigating climate and biodiversity loss issues where young people can use their knowledge to identify and suggest solutions.
- Level 3 Carrying out research in partnership relating to climate and biodiversity loss issues with cross-curricular approaches to involve all students.
- Level 4 Problem solving, researching a local issue in a sustained partnership with scientists from industry or academia to tackle a climate change or biodiversity loss issue that is local to their school or community.

The Climate Action Award across four levels is underpinned by approaches drawn from schoolbased citizen science projects. Therefore, this scheme has the potential to increase opportunities for children and young people to engage in research projects which support both their science education and increase pro-environmental attitudes and behaviours. This is consistent with the views of teachers and young people in the UK who have advocated for increased opportunities to learn about climate change and sustainability through research which leads to action within their communities (BERA, 2021; Dunlop et al., 2022).

1.4.3 Integrating the Sustainable Development Goals throughout (science) lessons

In 2015, the United Nations Member States adopted *The 2030 Agenda for Sustainable Development* which includes 17 Sustainable Development Goals (SDGs), each which have distinct targets, with a total of 169 targets. These goals recognise that 'ending poverty...must go hand-in-hand with strategies that improve health and education, reduce inequality, and spur economic growth – all while tackling climate change and working to preserve our oceans and forests' (UN, n.d.). The SDGs are the product of over 30 years of work, beginning at the Earth Summit in Rio de Janeiro, Brazil in 1992, led by the UN through the Department of Economic and Social Affairs (UN, n.d.). Table 4 outlines the 17 goals (UN, n.d.).

Goal	Short title	Full goal
1	No Poverty	End poverty in all its forms everywhere.
2	Zero Hunger	End hunger, achieve food security and improved nutrition and promote sustainable agriculture.
3	Good Health and Well-Being	Ensure healthy lives and promote well-being for all at all ages.
4	Quality Education	Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.
5	Gender Equality	Achieve gender equality and empower all women and girls.
6	Clean Water and Sanitation	Ensure availability and sustainable management of water and sanitation for all.
7	Affordable and Clean Energy	Ensure access to affordable, reliable, sustainable and modern energy for all.
8	Decent Work and Economic Growth	Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.
9	Industry, Innovation and Infrastructure	Build resilient infrastructure, promote inclusive and sustainable industrialisation and foster innovation.
10	Reduced Inequalities	Reduce inequality within and among countries.
11	Sustainable Cities and Communities	Make cities and human settlements inclusive, safe, resilient and sustainable.
12	Responsible Consumption and Production	Ensure sustainable consumption and production patterns.
13	Climate Action	Take urgent action to combat climate change and its impacts.
14	Life Below Water	Conserve and sustainably use the oceans, seas and marine resources for sustainable development.
15	Life on Land	Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.
16	Peace, Justice and Strong Institutions	Promote peaceful and inclusive societies for sustainable development, provide access to justice for all, build effective, accountable and inclusive institutions at all levels.
17	Partnership for the Goals	Strengthen the means of implementation and revitalise the Global Partnership for Sustainable Development.

The fourth SDG, Quality education, includes a target which aims that:

By 2030, all learners acquire knowledge and skills needed to promote sustainable development including among others through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship, and appreciation of cultural diversity and of culture's contribution to sustainable development. (UN, n.d.)

This is a clear mandate for the central role of education in enabling young people to live sustainable lives and respond to the challenges of climate change and biodiversity loss. A vital part of this is science education, including learning about scientific concepts, ideas and knowledge through inquiry, which should be part of education for all, regardless of whether young people intend to pursue careers as scientists (Harlen & Qualter, 2018). Strachan and Davey (2022) outline a series of science-focused resources for each of the 17 goals which can be adapted by teachers to suit their context. For example, the resource can be used as a starting point to inform individual lessons, frame a sequence of teaching and learning and/or to inform a themed 'sustainable science week' (Strachan & Davey, 2022). The SDGs have been used to frame lessons across a range of subjects beyond science including geography (e.g., Hope & Healy, 2020), maths (e.g., WWF, n.d.) and English (e.g., British Council, n.d.) with a wealth of open-access teaching resources widely available. However, it is important to consider the SDGs in a wider context, as some have noted the need to decouple sustainability and development, as development can foreground economic priorities (Dunlop et al., 2022).

1.4.4 Creative and arts-based approaches

The visual arts can engage people in different ways to essay writing or textbook-based learning because they enable the expression of ideas, knowledge and experiences which are not easily communicated through words. This can allow for new and deeper ways of engaging with the challenges of climate change and possible responses (Dunlop et al., 2022). Arts-based practices can also include and amplify marginalised voices, enabling information sharing amongst diverse audiences in ways that increase accessibility, particularly for non-academic audiences (Dunlop et al., 2022; Nunn, 2020; Tarr et al., 2018). In this way, they are important for building connections between groups with common and divergent interests. The arts can enable the creation of new meanings which mobilise emotions (Bartlett, 2015), and which are important in the context of climate change education because they can meaningfully connect people with the environment, including teachers and students (Dunlop & Rushton, 2022a; Walshe et al., 2022; Walshe et al., 2023). Thinking about or imagining the future is understood in the research literature as an important element of climate change education (e.g., Hicks & Holden, 2007; Doyle, 2020; Finnegan, 2022) because it creates opportunities for young people to engage with a range of possible outcomes that are not solely negative. Accordingly, researchers have highlighted how arts-based approaches can support thinking about the future and the actions that different groups can take to realise a more climate-positive future (Dunlop et al., 2022; Trott, 2021). Arts-based practices have been used with young people to promote engagement and enhance empowerment (Lyon & Carabelli, 2016).

Similarly, dialogic learning approaches provide opportunities for students to explore, discuss, reason and explain, which can improve students' engagement and attainment (Jay et al., 2017). Role play has long been recognised as both raising awareness of environmental issues and providing a framework for pupils to explore their own role and influence on their environment (Taylor, 1983). In the school context, role play activities can provide a framework for school pupils to explore and discuss their school context and the different responsibilities and roles members and groups in the school community have in caring for the school environment. These groups could include pupils, teachers, other school staff, parents and local and national politicians and decision makers. Role play allows pupils an opportunity to take on the role and identity of another person, group or perspective. By its nature, role play does not have pre-determined outcomes or answers: there are multiple, if not infinite, ways to respond which engenders inclusivity. Through role play, students can discuss evidence and values and make decisions with incomplete or uncertain information. Therefore, role-play activities have the potential to encourage 'confident participation in the global climate conversation' (Stoeth & Carter, 2022, p.1). Furthermore, role play



provides students with an opportunity for deliberative discussion to enable them to better understand their own and others' viewpoints and knowledge about climate change (e.g., Yale Climate Communication, n.d.) which Monroe et al. (2019) contend is part of effective climate change education.

Here, we have considered only four examples of the many approaches to climate change education as part of formal schooling. Before considering the contexts of India, Iraq and Zambia, we first explore some of the challenges which schools encounter in the context of climate change education.

1.5 Challenges for school-based climate change and sustainability education

Thus far, this report has outlined the place of climate change education in national policies, including national curricula and has explored the different conceptualisations and framings in these documents. We have also considered what is understood as effective climate change education in the research literature and look in more detail at four distinct but related approaches. Implementing climate change education through formal schooling is not without difficulty and challenge and here we provide an overview of some of the key challenges.

Firstly, climate change and sustainability education is a **complex and potentially contentious** topic. Part of the complexity exists because of the ways that climate change education is variously understood, and this is evident in the implementation of CCSE in national policies, as has been previously outlined in Section 1.2. Anthropogenic climate change and therefore climate change education continues to be contentious in some parts of the world, including in the US (Plutzer et al., 2016; Smith & Leiserowitz, 2012; Wise, 2010). Even when there is broad support in government policy for teaching climate change in schools, such as in Singapore, some teachers continue to view and experience teaching climate change as a 'controversial issue' (Ho & Seow, 2015). International non-governmental organisations, such as UNESCO and the British Council, have an important role to play as trusted organisations with well-established networks which can support the development and implementation of effective climate change and sustainability education, which is founded on in-country knowledge and is part of a collective effort. As such, and with extensive experience of enabling partnerships between schools in the UK and across the world, the British Council is well placed to support countries at every stage of implementing school-based climate change and sustainability education and work with policy makers, schools, local communities and researchers to ensure that programmes respond to the realities of the local impacts of climate change and meaningful and authentic. This is consistent with the findings outlined in Area one of the Executive Summary.

Secondly, as has been underlined in Section 1.2, school systems which are predominantly framed around subjects (e.g., England) rather than learning outcomes and/or experiences (e.g., Wales and Scotland) can be restricted in the ways in which they can implement climate change education. For example, the focus on separate subjects can limit opportunities for holistic, cross-curricular teaching which both the research literature (e.g., Monroe et al., 2019), and some teachers and young people (e.g., Dunlop et al., 2022) understand as effective climate change education. Relatedly, some current framings of school-based climate change education are persistently and predominantly limited to science and geography (Dawson et al., 2022). This further reduces the number of students who engage with climate change and sustainability education, limits the opportunities for cross-curricular approaches, and diminishes the group of teachers who view climate change education as something which is part of their role. Whilst, in principle, the National Curriculum can afford teachers flexibility to incorporate climate change across their teaching, such flexibility does not always flow through to the classroom (Howard-Jones et al., 2021). Finally, any discussion of the ways in which National Curricula focuses teachers' practice also needs to consider the influential role that examinations and assessments play within the school systems, as part of a wider 'assessment culture' which shapes teachers' practice (Perryman et al., 2011; Perryman & Calvert, 2020) and workload (Walker et al., 2019). As Dawson et al. (2022) note, the focus on international testing programmes such as PISA, for example in Australia, mean that education plans tend to emphasise literacy, numeracy and science content knowledge over and above social

concerns, such as action-oriented climate change. Meaningful climate change and sustainability education extends well beyond what can be captured in exams and assessment, and previous research has identified that teachers and young people want them to be decoupled (Dunlop et al., 2022). Nevertheless, in the shorter term and pragmatically, changes to exam specifications might well have an impact on the breadth of climate change education that young people access through school. As outlined in Area two of the Executive Summary, the British Council and similar organisations have an important role in advocating for effective climate change and sustainability education and drawing on learning from previous initiatives such as CCGL (Ipsos & Learn More, 2022) which promote and enable global citizenship through school partnerships in over 30 countries. As Taylor et al. (2019) highlight, programmes which provide frameworks with clear areas for action and linked goals such as the Greening Education. The British Council is well placed to support the enhancement of school-based climate change and sustainability, consistent with UNESCO's ambition that every school is climate-ready (UNESCO, 2021a).

Finally, the teaching that children and young people have access to is crucial for their development; indeed, teaching quality is a determining factor in student outcomes in general, including those related to climate change and sustainability education. **Teachers, and their education and professional development, therefore, lie at the heart of climate change education**. Through Initial Teacher Education (ITE) and Continuous Professional Development (CPD) related to subject specialisms, age-phase expertise and/or related to climate change education, teachers can enhance their capabilities to support education's role in the large-scale change that is needed to transform people and cultures to more environmentally and socially sustainable ways of being.

As we have explored in Section 1.3, some teachers are able to find ways to integrate climate change education into their existing practice even in the absence of formal policy directives (Wise, 2010; Colston & Ivey, 2015; Drewes, et al., 2018; Dunlop & Rushton, 2022). Puttick and Talks (2022) underline that teachers in England frequently use news media and films/videos as resources for teaching climate change because they are easy to use, share and are often open access. This is a finding which is supported by a recent national survey of teachers' climate change education practice in England (Greer et al., 2023a) and underlines the importance of teachers' critical media literacy and exposure to diverse, quality resources which reflect the global nature of climate change. Relatedly, the diverse nature of such resources may at times be counterproductive, overwhelming teachers and leaving them unsure as to guality assurance. As Greer et al. (2023a) underline, there is a need for continued, significant, collaborative work between policy makers, teacher educators and teachers to ensure that teacher education and professional development meaningfully equip teachers of all subjects and age-phases to incorporate climate change education as part of their 'everyday' practice. As outlined in Area three in the Executive Summary, the British Council has extensive experience in working with schools and teachers in ways which enhance their professional lives and practice. This means they are well placed to provide networks and spaces for school leaders in relation to climate change and sustainability education, which build and strengthen communities of practice. This is consistent with the findings of Taylor et al. (2019) who underline the importance of teachers having access to (electronic) networks where they can share ideas and resources, engage with the research community and receive ongoing support.

Having considered three key areas of challenge, including the complex and contentious nature of climate change and sustainability education, restricted framings of CCSE in some national curricula and the limited coverage of climate change education in teacher education and development, we now explore three case study countries: India, Iraq, and Zambia. These provide examples of the ways in which international NGOs and governments can work together to support the development of climate change and sustainability education which is informed by the academic literature so that it is consistent with current understandings of effective approaches and at the same time, is culturally sensitive and context specific.

2.0 Enhancing climate change and sustainability education in India

2.1 Context of India

2.1.1 Climate change in India

India is the seventh largest country in the world with an area of over 3 million square kilometres, containing diverse ecological zones including the Himalayan mountains, the Thar Desert, jungles, mangrove forests, extensive coastlines, and the vast Ganges Plain – all intersected by the major rivers of the Ganges, Yamuna, Indus, and Brahmaputra (National Geographic, 2021). India is surrounded by the Indian Ocean with the Bay of Bengal to the East and the Arabian Sea to the West. The variety of climate zones in India give it a huge spectrum of biodiversity with approximately 12,000 flowering plants and 65,000 animal species (National Geographic, 2021), over 1,000 of which are classified as threatened (UN Data, n.d.).

India is divided into seven geographical regions:

- · The northern mountains (the Himalayas and the northeast mountain ranges)
- Indo-Gangetic plains
- Thar Desert
- Central Highlands and Deccan Plateau
- East Coast
- West Coast
- · Bordering seas and islands.

The range of geographical features of India gives the country a wide variety of climate zones broadly including arid heat in the northwest (Thar desert), temperate tundra in the north (Himalayas), and humid areas in the southwest, central, and northeast, as well as a number of diverse microclimate areas (Krishnan et al., 2020). The topography of India drives climatological seasons, a dominant feature of which is the Indian Summer Monsoon, with the rest of the year categorised broadly as the winter (December–February), pre-monsoon (March–May), summer monsoon (June–September) and the post-monsoon (October–November) seasons. India also experiences extreme weather events including tropical cyclones, thunderstorms, heat waves, floods, and droughts (Krishnan et al., 2020).

The regional climates of India have already been impacted by climate change and the increasing frequency of extreme heat waves, severe flooding, and catastrophic storms, as well as declining groundwater reserves and rising sea levels, pose serious threats to lives and livelihoods (Picciariello et al., 2021). The social and economic costs of increasing severe weather events and climate extremes have a significant impact on India as nearly 800 million Indians depend on climate-sensitive sectors for their livelihood (UNDP, n.d.). Health and agricultural sectors are the most affected, with wheat production expected to decline by 4–5 million tonnes with as little as a 1°C rise in temperature (UNDP, n.d.).

Other environmental issues caused by human activity in India include biodiversity loss and local air pollution. It is estimated that over 50 per cent of India's forests will change type, causing biodiversity loss and a shift in regional climate dynamics (UNDP, n.d.). High emissions mean India has historically ranked very low on global air quality assessments and it contains 21 of the world's 30 most polluted cities (Wolf et al., 2022).

India has an estimated population of over 1.4 billion (UN, 2023), making it home to almost one-sixth of the world's population (GoI, 2022). Despite this large population, India's per capita emissions are

about a third of the global average, with the 2022 IPCC report noting that Southern Asia contributed approximately 4 per cent of historical cumulative net anthropogenic emissions between 1850 and 2019 whilst supporting almost 24 per cent of the global population (GoI, 2022). However, predictions suggest that by 2050, India will be the second largest emitter of greenhouse gases, responsible for 11 per cent of all residual emissions (Wolf et al., 2022).

2.1.2 Government and policy context

India is a Sovereign Socialist Secular Democratic Republic divided into 28 states and 8 union territories with a federal government structure. The <u>Constitution of India</u> (2022) states that the government shall 'endeavour to protect and improve the environment and to safeguard the forests and wildlife of the country' (Article 48–A). It also states that it is 'the duty of every citizen of India to protect and improve the natural environment including forest, lakes, rivers and wildlife and to have ecological compassing for the living creatures' (Article 51 A (g)). As such, responsibility for setting up India's climate change agenda and formulating policies is taken up by the government through the below bodies and policies. States have power over implementation and thus there is a lot of variety between states in approaches to climate change education with some examples outlined below.

India has taken an active political involvement in global climate change policy (for example, India is committed to COP26 pledges including net-zero emissions target by 2070) and has additionally committed to several ambitious climate change targets through its Nationally Determined Contribution report in August 2022 (Gol, 2022). This report outlines that India aims to:

- Meet 50 per cent of India's cumulative electric power installed capacity from non-fossil sources by 2030.
- Reduce the emission intensity of GDP by 45 per cent below 2005 levels by 2030.

India has launched the <u>Mission LiFE</u> (Lifestyle for Environment) programme to propagate a healthy and sustainable way of living based on the traditions and values of conservation and moderation as a key to combating climate change. <u>Mission LiFE</u> covers seven themes – save energy, save water, reduce single-use plastics, adopt sustainable food systems, reduce waste, reduce e-waste, and adopt healthy lifestyles. For World Environment Day on 5 June 2023, the government of India launched a month-long mass mobilisation campaign on Mission LiFE following the 'whole of government' and 'whole of society' approach. The Ministry mobilised Central Ministries/Departments, State/UT Governments/Administrations, Institutions, and private organisations to spread the message of Mission LiFE. (REF: <u>https://pib.gov.in/PressReleasePage.aspx?PRID=1929495</u>)

In 2023, the Union Minister for Finance and Corporate Affairs set out new schemes and proposals for Mission LiFE (<u>Gol, 2023</u>), including:

- National green hydrogen mission to facilitate the transition towards a low carbon economy, setting an annual production target of 5 MMT by 2030.
- Launch of 'PM Programme for Restoration, Awareness, Nourishment and Amelioration of Mother Earth' (PM-PRANAM) to incentivise States and Union Territories to promote alternative fertilisers and balanced use of chemical fertilisers.
- 'Mangrove Initiative for Shoreline Habitats & Tangible Incomes' (MISHTI) will be taken up for mangrove plantation along the coastline and on salt pan lands, wherever feasible, covering an approximately 540 sq km area across nine coastal State and four UTs in five years (2023–2028) creating an estimated carbon sink of 4.5 million tons of carbon.
- 'Amrit Dharohar' scheme which will promote the importance of local communities in conserving the wetland ecosystem, encouraging optimal use of wetlands, and enhance bio-diversity, carbon stock, eco-tourism opportunities and income generation for local communities.
- A number of proposals have also been made, including an allocation of 35,000 crore for priority capital investments towards energy transition and net zero objectives, and energy security by the Ministry of Petroleum & Natural Gas; an inter-state transmission system for evacuation and grid integration of 13 GW renewable energy from Ladakh; and the establishment of 500 new 'waste to wealth' plants under GOBARdhan (Galvanizing Organic Bio-Agro Resources Dhan) scheme for promoting circular economy.

India has several Government bodies responsible for overseeing Climate Change related policy¹ producing multiple key policy documents². Predominant is the Ministry of Environment, Forest and Climate Change, which is responsible for planning and overseeing environment and climate change issues both domestic and international including reporting to UNFCCC, the Nationally Determined Contributions Registry and the Action for Climate Empowerment agenda. The Ministry oversees a number of portals in wide-ranging areas of climate change, with full details available in their annual reports.

One key policy document is the National Action Plan for Climate Change (2008) which focuses on solar power, enhanced energy efficiency, sustainable habitats, water, sustainability of the Himalayan ecosystem, sustainable agriculture, knowledge of climate change, and working toward a green India. The NAPCC includes the National Mission for Green India which promotes tree planting and community engagement in climate change education activities. It also incorporates the National Mission for Sustainable Agriculture and the National Mission on Strategic Knowledge for Climate Change.

Due to the large geographical area and population size of India, states have autonomy to prepare State Action Plans on Climate Change which enrich the national plan whilst addressing differing priorities in each state in response to local climate vulnerabilities (MECCE, 2023). Some examples include:

- Delhi (2009) climate change education through public awareness campaigns and school education programmes on topics such as water pollution, nature conservation, and agricultural practice.
- Uttar Pradesh (2014) most populous state, plan focused on building public awareness through state-level media platforms and using climate change education in teaching about conservation, Indigenous and sustainable practices, and low-carbon lifestyles.
- Gujarat (2014) state with longest seashore, integrated climate change education in school curriculum, focus on adaptation and mitigation; set up its own Climate Change Department in 2009.
- Kerala (2014) focus on developing biodiversity conservation and training for sustainable farming methods and agricultural adaptation measures.

- The <u>Department of Science and Technology</u> funds and runs schemes and projects to support environmental education.
- The <u>National Clean Development Mechanism Authority</u> evaluates sustainable development and protects and improves the quality of the environment under India's commitments to the Kyoto Protocol.
- The <u>Centre for Climate Change and Disaster Management Disaster Mitigation</u> oversees developing disaster risk reduction strategies, managing community-based disasters, assessing the impacts of climate change on agriculture and other industries, and developing climate-resilient and adaptive strategies in agriculture.
- The <u>National Bank for Agriculture and Rural Development</u> and the <u>Ministry of Agriculture and</u> <u>Farmers Welfare</u> – undertake <u>research and development</u> into and provide funding for climate adaptation projects.
- The Ministry of Statistics and Programme Implementation and the <u>National Institution for Transforming India</u> Aayog – responsible for monitoring and reporting on the Sustainable Development Goals (SDGs) using the <u>National Indicator Framework on SDGs</u> (2016).
- The <u>Climate Change Finance Unit</u> of the <u>Ministry of Finance</u> provides analytical financial inputs for the national climate policy frameworks.
- The <u>Prime Minister's Council on Climate Change</u> (2007) According to the <u>United Nations Development Programme</u> (UNDP), the Council's mandate is to: "(a) prepare a coordinated response to issues relating to climate change (mitigation and adaptation) at the national level; (b) provide oversight for the formulation of action plans in the area of assessment, adaptation and mitigation of climate change; and (c) periodically monitor key policy decisions." (n.d.).
- 2 Other key policies & papers (Climate Change):
- The 3rd Biennial Update Report to the UNFCCC (2021) report on energy, emissions, forests, environmental regulations for industry, and climate action initiatives.
- The National Environment Policy (2006) recognises the importance of education and states that scientifically valid information must be
 embedded in curricula at all stages of education to promote capacity building, training, and public access to information.
- The Climate Change Action Programme focus on increasing capacity for climate change assessment, establishes frameworks for climate-related actions within sustainable development context at both central and state government level. USD\$ 286 million has been released for initiatives under the Programme to build capacity in states including Madhya Pradesh, Nagaland, and Telangana, and for two demonstration projects in Tamil Nadu and Madhya Pradesh.
- 2nd National Communication (2012) to the UNFCCC focus on capacity building, public awareness, and public participation, in regard to relationships between humans and the environment.

¹ Other key Government bodies (Climate Change):



2.1.3 Schooling in India

Education has long been a key area for policy in India with 26 per cent of the 2021 population comprising those aged 14 years or under, and 43 per cent 24 or under (UNESCO, 23). Since the 2009 Right to Education (RTE) Act, primary education in India has been compulsory from age 6–13 years and formal school education is available from 3–17 years. In 2022, the net enrolment rate for primary education was 89.1 with a fractionally higher enrolment ratio for females than males (112.04 and 110.96 respectively) (UNESCO 23). Secondary enrolment rates were lower at 67.2 with an enrolment ratio of females and males very similar (78.75 and 78.78 respectively) (UNESCO, 23). However, high enrolment rates don't necessarily reflect widespread academic achievement. The Annual Survey of Education Report (2018) highlighted that the percentage of children in government schools, approximately 52 per cent of primary aged children attending school (Gol, n.d.), who can read at least a Grade 2 level text remains low. It reported that 9.3 per cent of Grade 2s, 20.9 per cent of Grade 3s, 34.2 per cent of Grade 4s, and 44.2 per cent of Grade 5s could read the Grade 2 text (ASER, 2018). In 2020, India spent 4.5 per cent of its total GDP on education (The World Bank, 2022).

The National Council of Educational Research and Training is responsible for developing the National Curriculum Framework (NCF) and reviewing the framework at regular intervals (GEEP, n.d.). Three main boards officially govern India's formal education system:

- The Central Board of Secondary Education provides overall national framework and guidelines
- The Council for the Indian School Certificate Examinations
- The International Baccalaureate.

Most states have their own state education department that formulates their state-specific policies and programmes, determines their own curriculum, and conducts board exams for classes 10 and 12 (MECCE, 2023). It is common that students will learn three languages at school: English, Hindi, and their local language, except in regions where Hindi is the primary language.

2.2 Climate change and sustainability education in India

Environmental Education (EE), which includes climate change education, is compulsory at all levels of formal education in India (GEEP, n.d.). This came about in 1991 when the Supreme Court declared that 'we accept on principle that through the medium of education, awareness of the environment and its problem related to pollution should be taught as a compulsory subject' (GEEP, n.d.). NCERT then prepared a syllabus for EE which the Supreme Court directed schools in every state to adopt for Grades 1–12 in 2004, this is one of very few orders that apply to the entire formal education system in India (GEEP, n.d.).

There are a number of policies and papers guiding practice for CCSE in India³, including specific mention of CCSE in the National Education Policy (2020). In the National Education Policy, Protection of the Environment is stated as a common core for the National Curriculum Framework which makes clear NCERT's view that 'The School curriculum should highlight the measures for protection and care of the environment, prevention of pollution and conservation of energy' (Sharma, 2016).

The Environment Education Division (EED) of the Ministry of Environment, Forest, and Climate Change is responsible for the 'Environment Education Programme' which provides varied pedagogical initiatives including workshops, exhibitions, campaigns, competitions, and summer camps etc. to sensitise school children on issues related to environment and motivate them to adopt sustainable lifestyles (REF: MEFCC annual report 2022–23 pg.194). The EED also links various ministerial divisions including acting as the Nodal Division in the Ministry for matter related to National Education Policy (NEP), 2020. The EED draws on the existing Eco-club network in schools across the country formed under the National Green Corps Programme (NGCP) which works to promote environmental awareness among school children. The NGCP's main activities include projects on waste segregation, tree planting, cleanliness drives, and celebrating important environmental days to promote environmental education.

There are a number of non-governmental EESE initiatives including those organised by:

- The Centre for Environment Education (CEE) which focuses on climate literacy, knowledge exchange, public awareness, and participation. CEE produces programmes that further environmental education, sustainable development, and climate change awareness in multiple states across India, for example:
 - Paryavaran Mitra (Friend of Environment) aims to build environmental leadership among students in Grades 6 to 8 through positive behaviour change on four key topics: Water and Sanitation, Energy Waste Management, Biodiversity and Greening, Culture and Heritage.
 - Eco-Schools Programme example of school project: Eco-Schools Waste Management Programme (August 2020 to February 2021).
- The Energy and Resources Institute, which leads the GREEN Olympiad schoolbased scheme which reaches nearly 2,000 schools annually in India and internationally to sensitise and build capacity of students on environment, sustainability, and green skills.

³ Other Key Policies & papers (CCSE):

The National Education Policy (2020) – states that environmental education, including climate change, is expected to be taught in all higher education institutions, focusing on development of skilled labour, particularly in biology, climate science, and agriculture; emphasises integrating environmental awareness and knowledge about conservation of natural resources and sustainable development and promotes development of technical skills in agriculture for climate change (MCCE, 2023).

National Policy of Education (1986; modified in 1992) – states that protection of the environment was a common core around which a National Curriculum Framework would be created.

The National Curriculum Framework (2005) – includes environmental education rather than specifically climate change education, includes teaching
 on Habitat and Learning, pollution and global warming.

The National Focus Group Paper on 'Habitat and Learning' (2006) – focus on environment and conservation with study of environmental degradation.

Curriculum integration

The approach to EE mandated by NCERT is primarily interdisciplinary with EE woven through a range of subjects including science, social studies, mathematics, languages, and others. This approach encourages multidisciplinary teaching of environmental topics and issues, enabling teachers and students to draw on knowledge from a range of subjects. In the proposed 2023 National Curriculum Framework, EE is listed as an interdisciplinary area making a clear commitment to: 'Education about the environment and related urgent issues such as climate change; and the development of moral and ethical capacities' (pg.335). Details on approaches to EE can be found in section 7.1 of the proposed 2023 NCF (pp.337–369) which provides details on the learning goals for each school stage as outlined below:

- Preparatory stage: Grades 3–5
 - EE is taught through an ongoing interdisciplinary topic of 'World Around Us'.
 - 'World Around Us lays the basis for environmental literacy through helping students formalise their informal understanding of the environment. They develop an appreciation of their immediate environment and sensitivity towards their own needs as well as the needs of others. Students also develop process capacities and learn about tools to make sense of their environment.' (pg.338)
 - The aim of 'World Around Us' is to enable students to:
 - · Engage with social and natural environments.
 - Develop sensitivity and take action.
 - Develop love and appreciation for natural and social environments.
- Middle stage: Grades 6-8
 - 'At this Stage, concepts related to Environmental Education are integrated into Science and Social Science. This is to ensure adequate focus on the development of key concepts related to Environmental Education.' (pg.537)
- Secondary stage: Grades 9–10
 - 'Students in the Secondary Stage must be able to (i) synthesise their understanding of concepts related to Environmental Education from Science and Social Science to develop a holistic understanding; (ii) be able to examine concepts and issues related to Environmental Education from multiple perspectives; (iii) view Environmental Education from the perspective of a socialecological system framework, as opposed to a pure science perspective; (iv) examine ethical and moral questions that arise from this perspective; and (v) be able to engage with authentic and updated information and news related to environmental issues and concerns.' (pg.367)

It is noted in the proposed NCF that pre-service curriculum must be updated to include Environmental Education to prepare student teachers for teaching such topics. Whilst it is proposed as an interdisciplinary topic, it relies mostly on drawing together sciences and social sciences with no reference to art or vocational learning. This becomes increasingly pronounced at the higher stages of education. At the secondary stage, the NCF recommendation is that EE should be carried out by a science teacher wherever possible and a social science teacher if no science teacher is available (pg.369).

A criticism of the NCERT approach to EE, particularly from the middle stage onwards, is that it is largely textbook and classroom-based with little active learning from the environment around them (GEEP, n.d.). To tackle this, NCERT encourage winter and summer camps outside of formal learning for teachers, students, and the community around local environmental issues with the following objectives (GEEP, n.d.):

1. Focus on developing action plans for plausible solutions to local environmental issues, such as domestic water pollution – primarily addressing the human dimensions of environmental issues.

- 2. Aim to empower the schools to adopt EE through hands-on opportunities to learn in the natural environment.
- 3. Teacher training camps are intended to build the capacity of teachers to implement EE through instruction and experiences with EE experts in outdoor education settings.
- 4. Aim to increase the popularity and use of the NCERT EE project books, as teachers and students see the value of EE through their environmental camp experiences.

State variance

While NCERT sets the national interdisciplinary approach for the syllabus and exams, states have the power to make independent adaptations to their curricula. However, the Rethinking Schooling report (2017) by the Mahatma Gandhi Institute of Education for Peace and Sustainable Development stated that schools which implement the Central Board of Secondary Education syllabi rather than a state-developed curricula have a greater emphasis on sustainability through education (MECCE, 2023).

Examples of state variance:

- At the Higher Secondary stage in Maharashtra, India's second-largest state, EE is taught as a separate subject that all students must take due to the rest of their academic structure which does not allow for easy integration of EE into other subjects (GEEP, n.d.).
- In Maharashtra, students learn through the Majhi Vasundhara (My Earth) programme, the first climate change school curriculum introduced at the state level. This programme, developed by the Department of Environment and Climate Change, the Government of Maharashtra, and the United Nations Children's Fund (UNICEF) for students in Grades 1–8 covers topics including energy, air, pollution, and climate along with topics such as biodiversity conservation, solid waste management, and water resources management, as well as encouraging behaviour changes or 'green habits' at a household level (MECCE, 2023).

Higher education

In addition to offering a wide range of courses specific to climate change education, all University Grants Commission institutions were required to implement a mandatory six-course module on Environmental Studies for all undergraduate degrees.

Teacher professional development

Teacher education is developed through the National Curriculum Framework for Teacher Education (2009) and the Pandit Madan Mohan Malaviya National Mission on Teachers and Teaching (PMMMNMTT). However, there is no mention of climate change and sustainability education in these documents. The government does offer optional online learning for teachers through the Swayam platform which can offer courses related to EE.

There are a large number of independent programmes that offer teacher training in areas connected with climate change and sustainability education⁴.

- 4 Examples of Teacher Professional Development Programmes offering content related to CCSE:
- Teachers Training Programme on Climate Change, offered since 2010 by an independent trust, the Climate Project Foundation – country wide, digital training reaching over 700 teachers, focuses on disseminating information covering topics including science, impacts, and climate change solutions, moving toward a sustainable future.
- Teachers Training Workshops on Climate Change and Sustainable Development in 2021 delivered by Techno India Group Public Schools, Y-East and the Climate Reality Project India – reached over 300 teachers.
- The Green Teacher Programme through the Centre for Environment Education and Commonwealth of Learning
 – over 700 teachers completed the programme which included four self-learning modules: Life Support Systems and Basics of Ecology, Understanding Sustainable Development, Environmental Education in Schools,
 and Resources and Opportunities for Environmental Education.
- Green Educators' Network launched by the Centre for Science and Environment in 2016 network of 500 educators undertaking initiatives including newsletters and knowledge forums.
- The South Asia Co-Operative Environment Programme (SACEP).
- The South and Southeast Asia Network for Environmental Education (SASEANEE).
- Some training is state specific for example, Teacher training on climate change organised by the Government of Madhya Pradesh in 2017 – trained over 850 teachers from 20 government schools.

2.3 Enhancing climate change and sustainability education in India

Environmental Education (EE) has long been part of formal education in India, after the Supreme Court mandate in 1991 (GEEP, n.d.) and there is a wide variety of opportunities for both formal and informal climate change and sustainability education (as part of EE) across all stages of learning. This gives India a wealth of expertise and resources from which to draw to enhance school-based climate change and sustainability education. Due to the size and diversity of India, each state has autonomy over the implementation of their education strategy, so any development of climate change and sustainability education needs to work within each context. Building on the extensive programme of EE already in place in India, we highlight two areas of development to further enhance climate change education, (1) holistic approaches to climate change education and, (2) teacher professional development.

Environmental Education in India is based on the National Council of Educational Research and Teaching's (NCERT, n.d.) recommendation for integration across a range of subjects including science, geography and social sciences. This cross-curricular approach to EE is consistent with wider literature (Rousell & Cutter-Mackenzie-Knowles, 2020) which underlines that climate change education should draw on approaches from multiple disciplines in a holistic way. To further develop this existing approach, a focus could be to foreground current curriculum opportunities and identify further ways for teachers and school leaders to implement a holistic approach to school-based climate change education. Rousell & Cutter-Mackenzie-Knowles (2020) argue that climate change education should be understood as distinct from science education and environmental education and a renewed focus on school-based climate change education might provide a useful stimulus for schools to review curriculum plans. Another important opportunity to enhance a holistic approach to climate change education could be through the existing model of NCERT summer camps, which encourage teacher and student engagement in environmental education through citizen science projects. Expanding this summer camp offer to include a specific focus on climate change education could further support holistic approaches to climate change education which, in the words of Rousell & Cutter-Mackenzie-Knowles (2020) include the 'scientific, social, ethical, and political complexities of climate change...which empowers children and young people to meaningfully engage with entanglements of climate fact, value, power and concern across multiple scales and temporalities' (p.203). As has been outlined in Section 1.4.2, climate action focused citizen science projects can foster current action and pro-environmental behaviour and build young people's future capacity for action (Ballard et al., 2017). India's approach to climate change and sustainability education includes a focus on STEM and climate-action focused citizen science projects and this emphasis on science and technology could continue, for example through the development of engineering-based solutions to water pollution issues (GEEP, n.d.). However, there is scope within citizen science projects which are framed through practice-based and interdisciplinary approaches, to draw on arts-based activities as part of a holistic approach to climate change education. As has been outlined in Section 1.4.4, creative and arts-based approaches can allow for different ways of engaging with climate change and possible responses (Dunlop et al., 2022) and can include and amplify traditionally marginalised voices (Dunlop et al., 2022; Nunn, 2020; Tarr et al., 2018). Furthermore, arts-based approaches can be developed in context-specific ways across the different states of India through collaboration and engagement with mandatory weekly visual and performing arts.



Whilst there is no explicit mention of CCE in initial teacher education (NCTE, 2009) there are a broad range of opportunities for CCE as part of continuous teacher professional development as outlined in Section 2.2.4. Access to teacher professional development varies significantly in India depending on the state and whether the school is a state-supported public school or a fee-based private school. Enhancing climate change and sustainability education through implementing teacher professional development as part of initial teacher education would be an important way to increase the capacity and capabilities of teachers to address climate change education through their subject specialism. As has been underlined by the wider literature (e.g. Li et al., 2021), implementing climate change education as part of initial teacher education which build both teachers' confidence and understanding is a vital part of improving the quality of and access to climate change education for all young people. Another opportunity afforded by both initial teacher education and continuous professional development is that these spaces provide opportunities for dialogue between teachers of a range of subject and age-phase expertise which focus on holistic and integrated climate change education, which is already recognised as valuable by NCTE (2009). As with schools worldwide, teachers working in India face multiple demands on their time and high workloads which can restrict opportunities for cross-curricular collaboration. Teacher professional development which focuses on cross-curricula climate change and sustainability education is one way to foreground and enable teachers to collaborate and can provide the impetus for holistic approaches to school-based climate change education. As outlined above, a large variety of professional development opportunities already exist for teachers in India. Therefore, an important contribution could focus on supporting teachers to identify and navigate these schemes both individually and collaboratively across and beyond their school contexts, so that they are able to identify the professional development which best suits their needs and those of the communities in which they work.



3.0 Enhancing climate change and sustainability education in Iraq

What follows is a condensed version of Rushton and Greer (2023)'s report, *Enhancing Climate Change Education in Iraq*, which was completed in May 2023 on behalf of the British Council.

3.1 Context of Iraq

3.1.1 Climate change in Iraq

Iraq is already experiencing the effects of climate change and the country's long-term vulnerability has been identified as being significant (Farand, 2022; Lo, 2022). Impacts include increasing temperatures, declining precipitation rates and increasing evaporation, and sea level rise means that southern parts of the Tigris-Euphrates delta are threatened by inundation. These issues are compounded by damming of the Tigris and Euphrates rivers in Turkey, reducing the water flow into Iraq. With droughts, desertification and sandstorms, the ecological, social, and economic impacts of climate change in Iraq are already significant, and are predicted to intensify (Adamo et al., 2018). Security of water supply is of particular concern to the agricultural sector (Wasimi et al., 2018) which consumes 85 per cent of total surface water (Ministry of Health and Environment, 2018, p.196). Such water insecurity impacts food security, livelihoods, and compounds gender inequalities especially in poverty affected regions, and key bioregions (e.g., the Marsh Arabs in Southern Iraq). It forces farmers to leave rural areas and migrate to urban centes for alternative work (Wasimi et al., 2018).

The impacts of climate change, which vary across Iraq, are compounded by extensive periods of conflict in the region that have diminished economic, institutional, structural (e.g., intermittent electricity grid) and individual capabilities to adapt and mitigate its effects (Wasimi et al., 2018, p.240). Furthermore, Iraq's economic capabilities have also been impacted by fluctuating oil prices: the sale of oil is the country's main source of income which presents a structural complexity relative to developing and implementing a coherent climate change response.

Only 1.53 per cent of Iraq's land area is protected (as of April 2019) (Ministry of Health and Environment, 2018, p.197), which includes the internationally protected Iraqi Marshlands. The Ministry of Health and Environment has recognised that Southern Iraqi ecosystems are vulnerable to climate change (Ministry of Health and Environment, 2018) with habitat loss a major concern. In Northern Iraq deforestation and associated habitat loss has emerged as a major issue due to 'successive wars ... overgrazing, land exploitation, excessive hunting, unplanned development urbanisation' (Ministry of Health and Environment, 2018, p.197).

3.1.2 Government and policy context

The government of the Republic of Iraq, also referred to as Central and Southern Iraq (CSI), is based in Baghdad. The government of the Kurdistan Region of Iraq is based in Erbil. Kurdistan is an autonomous region in north-eastern Iraq that is bound by Iraqi laws and has separate legislative, executive and judiciary powers, and its own environmental legislation (Abdulkarim, 2018, p.210). There are 18 provinces in Iraq, with 15 in CSI and three in the Kurdistan Region.

Relevant policy commitments include Iraq's Nationally Determined Contribution (NDC) under the Paris Agreement (UN, 2015a) which was submitted in 2021. The NDC sets out a commitment to greenhouse gas emission reductions of 1–2 per cent from industrial activities until 2035 (Central State Iraq, 2021). The NDC also includes commitments to energy efficiency improvements, renewable energy technology, and sustainable public transport. It recognises key challenges related to electricity supply, with major damage to distribution services during the ISIS incursions, such that it is unable to meet load demands.

The NDC includes a commitment to 'environmental awareness' (Central State Iraq, 2021, p.6) which involves motivating vulnerable groups 'to contribute and participate individually and collectively in protecting the environment and presenting its resources' (ibid.). It recognises women and children as being more vulnerable to climate change than men, yet the report does not mention school-based education as a sector that will be impacted by climate change, or a sector that can play a role in society's response to climate change. Thus, significant scope exists to enhance climate change education as part of a national policy response to climate change.

3.1.3 Schooling in Iraq

Schooling in Iraq comprises four stages and Article 34 of the Iraqi constitution (2005) includes the right for all children to access education. Schooling begins with early childhood education for 4- to 5-year-old children. Primary school, which is mandatory, begins at age 6 for six years. Students must pass a national exam at the end of primary school to be eligible for entry into intermediate (high) school (Grades 7–9), then pass the National Intermediate Baccalaureate Exam to enter secondary school (Grades 10–12). There are two types of secondary school – General and Vocational – which both require students to take and pass a Baccalaureate exam at the end. In the Kurdistan region, students attend basic school from grade 1 to 9, then preparatory school from grade 10–12 (UNICEF, 2016).

At the end of their school years, students can access free tertiary education in public universities (as well as some private institutions). To enter university, students must pass the Baccalaureate qualification and are then assigned a degree course lasting four or five years. Issues in tertiary education include skilled academics and research capabilities, suitability of education and research infrastructure, management infrastructure, curriculum development and international links. Undergraduate degrees are followed by post-graduate degrees and doctoral degrees.

There are national inspection criteria in Iraq with 25 standards across five domains to evaluate schools' performance. These domains are: school administration; the state of the building; the extracurricular activities provided; evaluating the teaching staff; context of the school; and student learning. In the Kurdistan region, the inspections are overseen by the head of supervision in the Ministry of Education and carried out by local inspectors.

3.2 Enhancing climate change and sustainability education in Iraq

Drawing on previous in-depth work undertaken in collaboration with British Council Iraq earlier this year (Rushton & Greer, 2023), we share insights on how climate change and sustainability education in Iraq could be developed and strengthened. We note that Iraq's climate change and sustainability education is at an emergent stage in comparison to other nations and contexts. However, there is increasing government support for climate change and sustainability education including policy makers with responsibility for Education and the Environment from both Central State Iraq and the Kurdistan region. There are clear opportunities for British Council Iraq and wider teams to build on this support and focus, especially given that COP28 will be held in the region, at Dubai in December 2023 and this provides an important opportunity to showcase Iraq's developing climate change and sustainability education portfolio.

As with many countries and contexts whose climate change and sustainability education is in earlier phases of development, it is especially important to engage with teachers and wider members of the school community when seeking to develop policy related to climate change education. This engagement should include understanding and identifying existing practice, opportunities to

enhance practice and the support which teachers and schools require. In our previous report (Rushton & Greer, 2023), we outlined four recommendations related to teacher education and professional development including:

- **Teachers of all subjects and age phases** should have access to climate change and sustainability-focused professional development during Initial Teacher Education (ITE) and throughout their career.
- Teacher professional development should equip teachers to draw on their subject expertise (e.g., art, mathematics, science) to incorporate climate change and sustainability into their teaching and should enable teachers to develop pedagogical approaches which support students to take action to address the impacts of climate change.
- Teacher professional development should be **offered in a variety of formats** (e.g., online and in-person workshops, access to free resources, opportunities to engage with other teachers) and be **sufficiently flexible** so that it is widely accessible, especially to teachers who have limited access to resources (e.g., computers).
- Teachers require the **support of school leaders** to engage with ongoing professional development, which should also be **recognised as a priority by the school inspectorate and policy makers**.

We also note the importance of using all resources that are widely available to schools to support climate change and sustainability education which is action oriented. For example, **school sites** (including classrooms, school yard, outside space), operations (such as resource use, waste disposal, transport) and governance are all important opportunities for school communities to learn about **climate change and take action** which is readily visible at the local level. Relatedly, engagement with local community groups can provide important sources of local support and expertise. In their report, Rushton and Greer (2023) highlighted the ways in which extra-curricular activities are a **significant way to enhance climate change and sustainability education in Iraq and ensure it is locally relevant and meaningful**. This includes the following recommendations which can be used to inform the development of such extra-curricular activities:

- The further development of **arts-based practices** can support transformative climate change education which supports **students' emotional responses** to learning about and living with the impacts of climate change and draw on the rich cultural contexts of Iraq and the Kurdistan region.
- The provision of effective climate change and sustainability education can be enhanced by adapting Iraqi schools' existing extra-curricular programmes. Doing so might not necessarily require additional staffing or other resources.
- The continued development of **dialogic and student-centred teaching approaches** in school in Iraq and the Kurdistan region can enhance the effectiveness of climate change education by supporting students to take positive action for the environment.
- Extra-curricular activities should have clear relevance to the social and environmental context of the school community.

The report by Rushton and Greer (2023) includes an Appendix with stimulus materials for climate change education-focused extracurricular activities including the incorporation of role play and song and dance, poetry recitals, art exhibitions and school trips.

A key mechanism for developing Iraq's emergent climate change education is the **education and professional development of teachers** so that teachers are supported to develop and use approaches to teaching and learning in the context of climate change that are relevant and meaningful for children, young people and their wider communities. In the Iraqi context, this could mean that teacher education and professional development programmes incorporate opportunities for teachers to develop practice in relation to climate change and sustainability education which foregrounds the role of **extra-curricular activities** which include **student-centred and artsbased approaches** which engage and are supported by the **wider community**. This engagement of local communities is an important part of expanding the knowledge and understanding of climate change and its causes and impacts across the general population. Such an approach has been effective in other contexts, including Zambia, and in the following section, we now explore in more detail climate change and sustainability education in Zambia.

4.0 Enhancing climate change and sustainability education in Zambia

4.1 Context of Zambia

4.1.1 Climate change in Zambia

Zambia is a landlocked country located in the Eastern Africa Region and contains the central African plateau (between 1,000–1,600m above sea level) as well as large rivers (including the Zambezi River from which the country gets its name), expansive wetlands, and significant agro-ecosystems (GRZ, 1994). Zambia has 20 national parks, 39 game management areas, 432 forest reserves, and 59 botanical reserves with over 40 per cent of the country's land as protected areas of conservation (IUCN, 2023). In 2021, 121 species of animals living in Zambia were identified as threatened, up from 67 in 2010 (UN Data, 2023). The proportion of land area covered by forest declined from 63.3 per cent in 2000 to 60.3 per cent in 2020 (UN, DoESA n.d.).

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Zambia has seen rapid population growth and increasing urbanisation since 1969 when the census reported a population of 4 million with 20 per cent living in urban areas (GRZ, 1994). In 2021, Zambia had a population of 18.9 million, 44 per cent of which live in urban areas including 2.6 million people in the capital city, Lusaka (UN Data, 2023). Agriculture is the largest contributor to employment in Zambia, providing a livelihood for over 70 per cent of the population and it makes up 8.7 per cent of GDP (GRZ, 2017). Tourism is another vital component of the Zambian economy, making up 9.9 per cent of GDP in 2022 when Zambia welcomed over 1 million international tourists and over 330,000 domestic tourists (GRZ, 2023). Finally, mining (predominantly copper and cobalt) accounts for about 12 per cent of GDP and, whilst there are initiatives to diversify the economy, mining with its associated environmental impacts remains an important part of the economy (Kolala & Dokowe, 2021). The rapid expansion of population, urbanisation, industrialisation and increasing agricultural demands have threatened the sustainable use of Zambia's rich natural resources (GRZ, 1994).

In addition to the pressures on resources, Zambia has been experiencing increasingly destructive climate-related hazards. For example, since 1960, there has been a noticeable climate trend towards higher temperatures (0.3 degrees C per decade) and lower rainfall (decreased 2.3 per cent per decade) (GRZ, 2021). Water availability is expected to decrease by 13 per cent by the year 2100 (MECCE, 2023). Floods and droughts over the last 20 years are some of the worst on record and in 2019, 2.3 million people were affected by disaster (UN DoESA, n.d.). The Southwest Region and Western areas of Zambia are experiencing a higher frequency of climate-extreme events (such as droughts/flash floods) (GRZ, 2021). Such climate-induced events threaten the long-term Zambian economy, social, and environmental sustainability with impacts on water, food, and energy security (GRZ, 2021).

The agricultural sector is particularly vulnerable to climate change, as the vast majority of agriculture is small-scale, rainfall-reliant farming (GI, 2018). Tourism in Zambia is also reliant on a range of environmental resources including wildlife biodiversity, water levels and quality, and weather suitability (e.g., droughts, floods, heatwaves, wildfires), meaning the impact of climate change can affect the sustainability of tourist destinations (Mubita et al., 2023).

Whilst facing severe impacts of climate-change-related issues, Zambia is a low-emitting country in greenhouse gas emissions, ranked 75th globally (Global Carbon Atlas, 2020). The 3rd National Communication (GRZ, 2020) shows land use as the biggest source of greenhouse gas emissions, predominantly agriculture and forestry, contributing 95 per cent in total. Energy contributes 2.6 per cent, industrial processes and product use is 1.3 per cent, and waste is 1.1 per cent (GRZ, 2020).

4.1.2 Government and policy context

Since attaining independence and becoming a republic in 1964, the central government of Zambia, the National Assembly, is run by an elected president who can sit for no more than two five-year terms.

The key government ministries for this report are:

- The Ministry of Education
- The Ministry of Lands and Natural Resources
- The Ministry of Green Economy and Environment.

Other relevant government bodies include:

- The Ministry of Tourism responsible for promoting environmental awareness, water protection, tree planting, and improving energy conservation through environmentally sensitive materials and energy efficiency by using renewable energy in all tourist facilities (MECCE, 2023). The Ministry's Master Plan (2018–2038) works towards mitigating the impact of climate change on the tourist economy and tourist facilities.
- The Ministry of Finance and National Planning participates in the Zambia Strengthening Climate Resilience project (The World Bank, 2013) which aims to strengthen climate resilience and improve the adaptive capacity of Zambia's most vulnerable communities in 16 districts in the three northern regions of Luapula, Northern, and Muchinga (MECCE, 2023).
- The Ministry of Agriculture promotes environmentally sustainable farming e.g., crop diversification, increased crop and livestock productivity, and water management practices and fisheries production (MECCE, 2023).
- The Ministry of Energy aims to increase access to sustainable energy and to promote climate resilience in the sector (MECCE, 2023).

In 2022, Zambia adopted the Eight National Development Plan (8NDP) (GRZ, 2022) to support realising the national long-term Vision 2030 (GRZ, 2006) for the country across four development areas: (1) Economic transformation and job creation; (2) Human and social development; (3) Environmental Sustainability; and (4) Good governance environment. These development plans have been crucial in driving both education and environmental policy with both areas intersecting the strategic pillars (Muyunda, 2021).

There have been a number of significant policy reforms targeting educational development in Zambia, including: the Education Reforms of 1977, aimed at broadening access to all education including vocational training such as trade training, agricultural, and nursing colleges; the Focus on Learning Policy Paper of 1992, which emphasised enhanced quality of teaching and learning for primary and secondary education; and the 1996 Educating our Future policy reforms, which focused on access and participation, quality and relevance, and institutional development and management in education (HEA, 2021). In 2021, 4.6 per cent of GDP was spent on education from the government, an increase from 1.1 per cent spent in 2010 (UN Data, 2023).

The key climate change policy produced by the Ministry of Land and Natural Resources is the National Climate Change Learning Strategy (GRZ, 2021). The strategic objectives of the NCCLS are: (1) Raise awareness and strengthen climate change knowledge; (2) Build individual and institutional capacity in climate change mitigation and adaptation; and (3) Mainstream climate change learning into national priority sector policies and systems. The strategic objectives are derived from the identified national priorities and will be integrated in five identified sectors: energy, forestry, agriculture, health, and education (GRZ, 2021).

The Ministry of Land and Natural Resources is responsible for reporting on Zambia's action to the UN Framework Convention on Climate Change (UNFCCC). It acts as the Action for Climate Empowerment (ACE) focal point, a UNFCCC initiative which aims to empower all members of society to engage in climate action, through the six ACE elements: climate change education and public awareness, training, public participation, public access to information, and international co-operation on these issues (UNFCCC, n.d.).

4.1.3 Schooling in Zambia

The Ministry of Education (MoE) has oversight of early childhood education, primary, secondary and colleges of education. Primary school is both a choice and a right in Zambia for Grades 1–7 from the ages of 7–14 years. In 2019, Zambia had 87.9 per cent net enrolment in primary education and reported a 91.8 per cent completion to Grade 7 (UNICEF, 2019). However, there are regional disparities within this with Lusaka achieving a rate of 78.6 per cent and the northern region 81.3 per cent (72 per cent for female students) (UNICEF, 2019).

Secondary education is split into two cycles, Grades 8 and 9, then Grades 10, 11, and 12. Since 2022, a national policy of free education from early childhood through to secondary education has been introduced, with no fees required for tuition or examinations. Transition rates from primary to secondary are 67.8 per cent with a net enrolment of 42.9 per cent (UNICEF, 2019). In 2019, 55.3 per cent of students passed their Grade 9 exams, and 64.8 per cent passed their Grade 12 exams (UNICEF, 2019). Tertiary education can take the form of a 2-3-year college diploma or a 4-year bachelor's degree with post-graduate courses also available at universities, all requiring fees. Three recent, major policy reforms in Higher Education include: the Universities Act of 1992 which introduced private provision of university education (HEA, 2021); the Higher Education Act of 2013 which introduced quality assurance; and the National Higher Education Policy of 2019 which broadened the scope of the 2013 policy to include a range of higher education institutions as well as introducing changes to governance and management of universities. These reforms have diversified higher education in Zambia and introduced a legal framework of regulatory agencies and standards of accreditation procedures (HEA, 2021).

In 2000, a restructuring of school inspections resulted in the creation of the Directorate of Standards, Assessment and Evaluation to oversee education standards at national, provincial, and district levels. Education Standards Officers were designated to each subject area of: social sciences subjects, mathematics, sciences, languages, practical subjects, special education, business studies, expressive arts, distance and open learning and examinations (Mooya & Mutale Mulenga, 2021).

The key educational challenges faced in Zambia are inadequate teaching materials, shortage of teachers, inadequate infrastructure, poor reading and writing skills in primary schools and over enrolment resulting in overcrowding in classrooms (Mwanza, 2020). These challenges remain similar to those identified by the Ministry of Education in 1977 (GRZ, 1977), a focus on improving quality teacher training and quality teaching in secondary schools has been proposed as essential to improving education standards in Zambia (Mwanza, 2020). We now consider the current context of climate change education in Zambia.

4.2 Climate change and sustainability education in Zambia

Studies have shown that in Zambia, there is a wide variation in levels of understanding about the causes and effects of climate change (Muchanga, 2013; Fumo et al., 2008; Madison, 2007). Alongside biophysical and political causes for climate change, participants have also cited moral or spiritual causes (Muchanga, 2013). Researchers warn that in delivering climate change and sustainability education, consideration into its framing must be taken to ensure it is appropriate for the context of the diverse communities of Zambia (Muchanga, 2013).

The National Climate Change Learning Strategy (NCCLS) (GRZ, 2021) was developed to increase climate change awareness, improve knowledge about climate change, and position climate change and sustainability education as a national priority for policy and systems. It states the objective for climate change and sustainability education is to 'promote communication and dissemination of climate change information to enhance awareness and understanding of its opportunities and impacts' (p.12). The NCCLS aims to co-ordinate teacher training with curricula and dedicate full courses to climate change education in teacher training programmes to improve teaching quality.



The NCCLS builds on two key pieces of policy:

- The National Policy on Climate Change (NPCC) (GRZ, 2016), which outlines the importance of education, public awareness, and higher education research into climate change and its impacts for achieving Zambian climate and sustainability goals.
- The Zambia Education Curriculum Framework (ZECF) (GRZ, 2013), which acknowledges Education for Sustainable Development, Environmental Education, and Climate Change as some of the key cross-curricular issues to be addressed at each stage of education.

The ZECF outlines that education should include both knowledge about climate change as well as ways individuals can contribute towards addressing it (GRZ, 2013). It has led to developments in the curriculum to include climate change in Social Science subjects including Geography, Social Studies and Civic Education. The topics include environmental protection, conservation, sustainability/smart farming, environmental health, environmental hazards (human induced) leading to deforestation, pollution, soil erosion, land degradation, global warming, drought, and floods etc. Climate change features in the geography syllabus as students learn about the effect of climate change on the environment, recognise climate-induced hazards such as droughts, global warming, deforestation, and desertification, learn the effects of these hazards on people and the environment, as well as explore solutions (GRZ, 2013c). Climate change and sustainability also features on the agricultural science and biology syllabi covering topics such as the effects of agricultural practices, deforestation, the impact on soil and ecosystems, as well as sustainable farming practices (GRZ, 2013a; 2013b).

Teacher training has been identified as an important area of development for climate change and sustainability education in Zambia, with a recent study in Lusaka suggesting that climate change capacity building with teachers should be an area of focus alongside curriculum development and making climate change a compulsory subject at secondary school (Mubanga et al., 2022). Eighty per cent of teachers who were part of the study in Lusaka thought that 'the climate change knowledge prescribed under the current curriculum is not adequate to equip the learners with the requisite survival knowledge amidst the impacts of climate change' (Mubanga et al., 2022, p.22). There was significant support by participating teachers for introducing climate change education as a subject in primary school to address these issues (Mubanga et al., 2022).

Sustainability Starts with Teachers is a Southern African programme designed to build capacity for teacher education on sustainable development. Their recent report (SSwT, 2020) outlines their goal to enhance access to: (1) quality, equitable, and inclusive education and (2) to skills development (consistent with technical education and vocational and entrepreneurship training aspirations) as the pathway to improving climate change education.

In addition to formal learning, there are a number of education initiatives including the Climate Smart Action Toolkit by the Wildlife and Environmental Conservation Society of Zambia which focuses on tree planting and conservation agriculture (WECSZ, 2019). The Africa WildLife Foundation also promoted climate change education at primary level through their Classroom Africa program. In 2017, they worked with the Lupani Community School to identify 20,000 hectares of land to be designated for conservation (AWF, n.d.). UNICEF runs a programme, Empowering children in climate action, by creating over 1000 youth ambassadors for climate change awareness. Through localised advocacy and communication, they aim to provide information on climate change and adaptation actions to support Zambian sustainability goals (UNICEF, n.d.). The Zambia Family South Central Activity similarly engages young people in climate change and sustainability education activities such as tree planting, creating vegetable gardens, and eco-agricultural initiatives (e.g., woodlots to reduce use of firewood and reduce deforestation). The scheme prioritises practical lessons to understand impacts of climate change in their local area such as those caused by drought and rising temperatures to develop knowledge about action that can be taken by them as well as their families (Zambia Family, n.d.).

British Council Zambia is currently running the *Change and Sustainability Education Project* for students in Grades 5–12. In this project, students will have 12 art-based lessons to learn about environmental protection, conservation, sustainable/smart agriculture, and environmental health. Lessons will also include a focus on environmental hazards, consistent with the ZECF (GRZ, 2013).

Teaching will incorporate learning the science of climate change and its impacts, coupled with arts-based approaches to communicating climate change knowledge and potential solutions to local climate change issues in the form of original music, poetry, dance, or drama. These poems, songs and dance and drama performances will be presented at school exhibitions with audiences to include parents, community leaders and members, private businesses, and Ministry of Education representatives. The project will be supplemented by extra-curricular activities such as facilitated conversations, music/poetry exchanges, or art and design skill transfers. These will be supported by private sector stakeholders such as visual artists, welders, manufacturers, and businesses who will be encouraged to support young people to develop networks and provide mentoring focused on climate mitigation, adaptation, and carbon footprint calculation. As has been outlined, climate change education is established in Zambia, and we provide some reflections on how this may be further enhanced.

4.3 Enhancing climate change and sustainability education in Zambia

As has been outlined previously, there is a need to increase the general level of knowledge about the causes and impacts of climate change that responds to the needs of diverse communities in Zambia (Muchanga, 2013). Furthermore, there is an urgent need to continue to equip Zambia's population to adapt to the impacts already experienced, especially those which threaten two major areas of the Zambian economy: farming and tourism. Education, including formal schooling, has a vital role to play in this response and Zambia's recent National Climate Change Learning Strategy (NCCLS) (GRZ, 2021) provides a strong platform on which to build. Given this context, we highlight two key issues in relation to climate change in Zambia which helpfully inform the further development of climate change and sustainability education, consistent with the NCCLS.

Firstly, given the rapid population increase and the impacts of climate change including higher temperatures and rainfall variability which leads to both droughts and floods, **agriculture**, and in particular, developing **sustainable practices**, are a key focus. This includes reducing deforestation and developing adaptive practices which mitigate the impacts of climate change. Enhancing climate change education could include a focus on raising awareness of the links between climate change impacts and agriculture and supporting young people and their communities to develop agricultural practices which mitigate the impacts of climate change.

Secondly, and given the link between agriculture and deforestation, conservation is another key area of focus. This includes maintaining wildlife biodiversity and considering the ways in which tourism can be more sustainable and promote pro-environmental practices within and beyond the sector. Enhancing climate change and sustainability education could include supporting young people to further understand biodiversity in their local contexts and the ways in which this can be monitored and maintained. These topics are already included as part of the Zambian Education Curriculum Framework (ZECF), with an important emphasis that education should include both knowledge about climate change and the ways in which it can be addressed (GRZ, 2013). Whilst an action-oriented curriculum is consistent with wider research as to what constitutes effective climate change education (e.g., Monroe et al., 2019), it is important that individual actions are situated within a wider context of the roles and responsibilities of industry, business, governments and other decision makers to bring about change in relation to climate and environmental crises.

Across both the themes of agriculture and conservation, climate change and sustainability education could be further developed in three areas. Firstly, **a continued focus on skilldevelopment through practical activities**, perhaps including project-based learning or citizen science projects, could enable young people to develop a range of skills relevant to sustainable farming and local wildlife conservation. This approach is consistent with a range of projects implemented in Zambia, including current work led by British Council Zambia, where young people will develop their knowledge and understanding of sustainable or smart agriculture which they will share with their wider community through arts-based performance. Making explicit the skills that young people learn through participation in these projects (for example, communication skills and teamwork) in addition to the knowledge and understanding they develop is important so that young people can leverage the learning from these experiences in their future lives and careers. Secondly, we underline the importance of climate change and sustainability education which includes landbased engagement, including activities such as tree planting and creating and sustaining small produce gardens where possible as part of school sites as part of youth-led climate action. This approach could be further enhanced by continuing to include local community groups and partnerships in the development and support of these activities so that young people continue to be part of wider networks. Thirdly, the incorporation of arts-based activities to communicate knowledge and understanding about climate change provides significant opportunities for schools to cascade climate change information to the wider community. Arts-based approaches can also be rooted in local cultures and practices which can make for more meaningful climate change education (Rousell & Cutter-Mackenzie-Knowles, 2020). An important starting point to identify the ways in which these three approaches (and others) can enhance climate change and sustainability education in Zambia would be to develop a series of workshops for teachers, school leaders and policy makers which provide opportunities to explore current practice and identify ways to expand and strengthen the scope and impact of climate change and sustainability education in Zambia.

As with Irag and India, a key mechanism for enhancing climate change education is the education and professional development of teachers. In Zambia the important role that teachers play is recognised in the NCCLS (GRZ, 2021). Ensuring that, from the outset of their careers, teachers themselves are equipped with the knowledge and understanding of climate change, its impacts, and associated adaptations is an important aspect of successful climate change and sustainability education. It is also vital that teachers are supported to develop and use approaches to teaching and learning in the context of climate change that are relevant and meaningful for children, young people and their wider communities. In the Zambian context, this could mean that teacher education and professional development programmes incorporate opportunities for teachers to develop practice in relation to land-based and arts-based climate change education which enables children and young people to develop a range of skills and engage the wider community in climate change action. Whilst these approaches are already evident in school projects, a possible next step could be to embed these approaches as part of formal schooling, as the current curriculum predominantly focuses on knowledge development. As a first step to further identifying the current classroom and wider school-based practices of teachers, as well as the support required to extend and enhance these, we recommend the implementation of a survey, similar to that developed through the UCL's Centre for Climate Change and Sustainability Education's work with teachers in England and Iraq. This would provide an important starting point to better understand pockets of excellent practice and the resources and support required to implement this practice across the country.

5.0 Final reflections

The vital role of education in responding to the challenges of climate change and the need to live sustainable lives is clear. If climate change and sustainability education is to be effective and transformative, a global effort is required to ensure that all young people have access to education which equips them to live hopefully with a climate-altered future. Research-informed and culturally and contextually sensitive teacher professional development is a fundamental priority, and the British Council has a pivotal role working with teachers, young people, school communities and a diverse range of partners worldwide to implement effective and transformative climate change and sustainability education.

As both the wider research literature and the three country case studies of the British Council's work in India, Iraq and Zambia underline, there are clear opportunities to build and enhance existing climate change and sustainability education across the following areas: (1) Build, strengthen and enhance in-country knowledge and insight into effective climate change and sustainability education including through sharing national and international good practice; (2) Support and strengthen pathways to enhance teachers' access to high-quality professional development in relation to climate change and sustainability education; and (3) Strengthen and support leadership of climate change and sustainability education within schools.

As the current work across India, Iraq and Zambia underlines, whilst the principles of effective climate change and sustainability education are broadly consistent, each country, region and community can experience the impacts and engage with the realities of climate change in varied and distinct ways. This requires education which draws on a range of pedagogical approaches and contexts for learning so that all children and young people access high-quality climate change and sustainability education which develops their knowledge and capabilities and meets their learning, social and emotional needs. We reflect on the critical role of teachers in developing and implementing transformative climate change and sustainability education with and for their communities. Therefore, we argue that a key focus for governments, international non-governmental organisations. academics and teachers' professional associations and subject organisations is prioritising and valuing teacher professional development. Key priorities should include that teachers of all subjects and ages should have access to climate change and sustainability focused professional development from the outset and throughout their careers. Such professional development should equip teachers to draw on their subject expertise and develop a range of pedagogical approaches which support students to take action in the context of climate change and sustainability.



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