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Ready for the world

Embedding climate change education in geography

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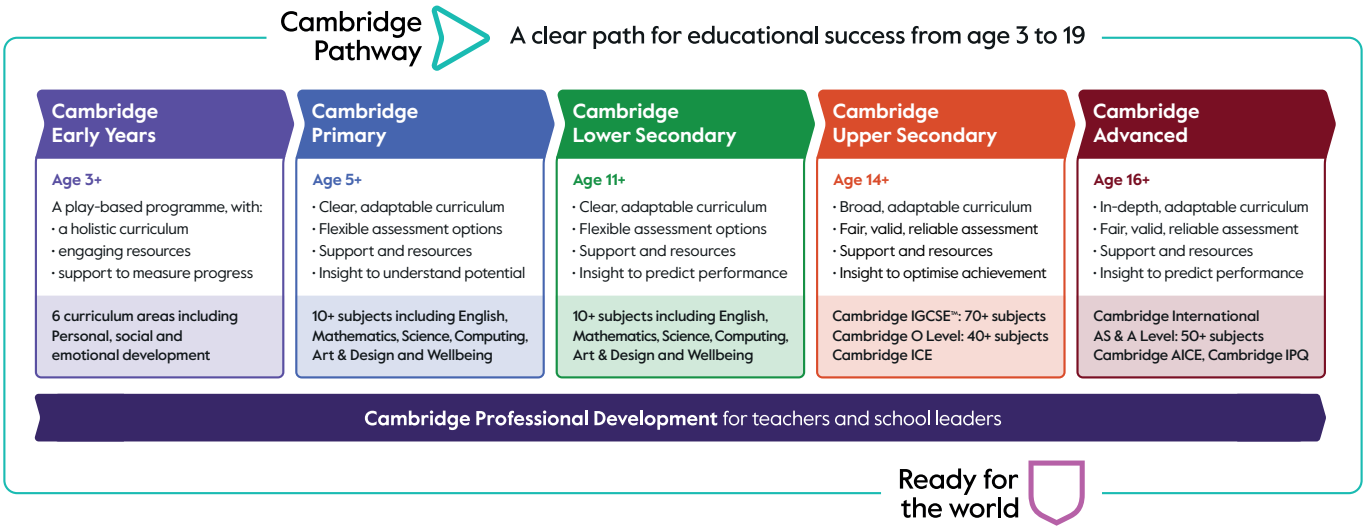
Contents

Preface

Cambridge University Press & Assessment (Cambridge) and Cambridge Zero are working together to explore how climate-related research and teaching connects with the design, development and delivery of curriculum, assessment and resources across all educational stages from ages 3 to 19.



About Cambridge University Press & Assessment

As part of the University of Cambridge and a leader in global education, publishing and research, Cambridge University Press & Assessment can progress action and debate around the world's most pressing challenges. We believe that education is key to tackling the climate crisis. Together with schools worldwide, our UK and international awarding bodies (Cambridge OCR and Cambridge International Education) are working to embed climate change education into the curriculum and empower learners to take action.

About Cambridge Zero

Cambridge Zero exists to maximise the University of Cambridge's contribution towards achieving a resilient and sustainable zero-carbon world. It does this by enabling, integrating and accelerating the University's climate activities related to education, research, policy and innovation. This includes through supporting:

- education and training to provide the knowledge and skills needed to deliver a different future
- research and innovation to drive technological and social change
- policy engagement at a UK and global level, with a broad coalition of stakeholders, to develop solutions collectively
- innovation mapping and entrepreneurship facilitation to drive climate collaboration across the Cambridge ecosystem.

Introduction: empowering young geographers

Climate change and its impacts pose a threat to our planet and lives. We need to respond at multiple levels across sectors, including education, to help us take action on climate change and adapt to future challenges.

At Cambridge we are acutely aware of our responsibility to prepare learners not just for today, but for the future. Our strong commitment to climate change education, led by our Global Director of Climate Education, Christine Özden, is one of the ways we are helping schools equip students with the skills and knowledge they need to adapt to future challenges.

Since COP28 in Dubai in 2023, we have accelerated its efforts to highlight the importance of climate change education and engage with other sectors, calling for a better preparation of current and future generations to tackle the climate crisis. These efforts are shaped by four key insights identified by Christine:

- We must amplify young voices.
- Climate education should be embedded across the curriculum.
- The climate crisis is a global issue that requires local and contextualised thinking and solutions.
- Collaborative partnerships are key in tackling the climate crisis.

As a result, we have collaborated extensively with academics from across the University of Cambridge, through Cambridge Zero and the Faculty of Education, to build understanding of how we can embed climate literacy in a range of subjects across the curriculum.

We have developed a Climate Change Education Framework. This outlines the key knowledge, skills and understanding required to empower learners to take action on climate change. You can read more about the framework here - **cambridgeinternational.org/climate-framework**

This paper focuses on geography and explores how we can foster scientific literacy, systems thinking and agency to help students find solutions to the climate crisis. It draws on research and teaching expertise from the University's Department of Geography and shares insights from our Geography Convocation in Cambridge. It also includes practical strategies to enhance curriculum, assessment and teaching materials to support teachers in confidently and practically bringing climate change education into their classrooms.

You can find more resources to support teaching and learning at **www.cambridgeinternational.org/climatechangeeducation**

Preparing learners for the future

Cambridge has initiated a global conversation with schools and learners worldwide to understand perceptions of 'future readiness' and how we can better shape education for students in a changing world. Almost 7000 teachers and students in 150 countries took part in the first phase of our research, culminating in a report – **Preparing learners to thrive in a changing world** (September 2025).

Our research found that only 45% of students feel they are well prepared for their future after education – compared to 67% of teachers. We also found that while many conversations are taking place in the classroom to help students understand the world around them, fewer students than teachers are reporting these conversations happening. For example, only 40% of students said they discuss climate change and environmental issues with their teachers, compared to 57% of teachers. This suggests these conversations are not as impactful as they could be.

One of the actions identified in the report is to better support students to recognise when and where they are developing future-ready skills in school, as this will build their self-belief and agency for the future. This presents an opportunity for geography education to embed climate literacy and to better signpost the skills students are developing through this learning, helping them understand how these skills prepare them for the future.

You can read the report at **www.cambridge.org/future-ready-learners**

Geography Convocation, Cambridge

In 2023, Cambridge University Press & Assessment and Cambridge Zero convened experts from across the University of Cambridge to explore how climate-related research informs geography education. The Convocation brought together scholars from the University of Cambridge's Departments of Geography, Applied Mathematics and Theoretical Physics, History and Philosophy of Science, Education, and the Scott Polar Research Institute.

Discussions at the Geography Convocation focused on embedding climate and sustainability knowledge into curriculum, assessment, and teaching and learning materials for learners aged 5 to 19, with an emphasis on geography's role in fostering interdisciplinary understanding and action.

Building on our previously published papers, which introduced our climate change education principles and strategies for empowering young engineers, this paper aligns with ongoing reviews of Cambridge OCR and Cambridge International Education geography syllabuses to ensure they equip learners for a climate-changed world. Our aim is to prepare students to navigate climate challenges and act as active contributors to sustainable solutions.

For details of Convocation participants, see page 16.

Key insights from the Geography Convocation*

1. Building climate literacy in the curriculum

The international education context indicates strong student demand for increased, high-quality climate change education. In a 2024 survey, over 90% of Cambridge students told us they want more **climate change education**[1] and 76% of teachers who took part in a Cambridge Panel survey agreed that climate change is a key issue of our time, and they have a crucial role to play.

> "More than 90% of Cambridge students want more climate change education"

In geography, education must ground students in the scientific foundations of climate change while fostering systems thinking and awareness of social dimensions, leading to deep understanding and agency.

At the Convocation, the discussions centred around four key areas:

1. Scientific understanding: In geography, a well-designed curriculum with appropriate teaching and learning resources can prepare learners with deeper knowledge and understanding of geographical ideas and systems. There is a recognition that learners are missing key scientific knowledge, including an understanding of the physical processes underlying climate change. These geographical concepts, such as awareness of greenhouse gases as a cause of climate change, are critical for deeper comprehension.

'Students need to understand the **mechanics** of the world around them at a deeper level than just remembering keywords and applying them in a limited essay style question. For example, if the Earth rotated the other way around its axis, what would change in the oceans and atmosphere? And in our weather and climate?'

A Convocation participant

'Students have very limited knowledge of the **oceans**, which can store massively more heat and carbon than the atmosphere or land. Oceans are crucial to climate change. Knowledge about what oceans are and how oceans work is crucial to good geography teaching. The oceans are also an important place of human geography and have a major place in our history and current world. For example, without trade winds and the associate surface currents, the Atlantic slave trade might not have happened.'

A Convocation participant

*This section of the paper represents the views of event presenters and is not a consensus statement.

Key insights from the Geography Convocation continued

2. Systems thinking: Climate change requires holistic approaches, moving beyond individual actions (e.g., recycling bottles or walking to school) to structural solutions. While there is a risk that learners view aspects of climate change in isolation, geography helps bring together social, environmental and economic perspectives to build a more connected understanding. In Cambridge IGCSE™ and International AS & A Level, we can provide learners with the opportunity to evaluate climate change as more than a physical event and to make sense of the issue themselves. The ability to place climate change in a broader context of social and economic change helps them become more capable navigators.

3. Intersectionality: Climate change can go hand in hand with other forms of inequality and can exacerbate issues for certain vulnerable communities due to injustices they battle with simultaneously. For instance, according to UN Women, gender inequality and climate change are interconnected, and women and girls experience the greatest impacts of climate change[2].

4. The need for a multidisciplinary approach: Cambridge believes that it is necessary to integrate climate change education across all subjects in holistic and actionable ways. Learners at primary school level are interdisciplinary learners in that they are exposed to different subjects throughout the day; therefore, taking a multidisciplinary approach in teaching climate change education allows them to see it beyond a single subject.

Comments from Convocation participant Stephen Lezak – PhD Candidate, Scott Polar Research Institute, Cambridge

'When climate change is most devastating, it is always intersectional and geographical – meaning that it overlaps with colonialism, extractive industry, poverty and oppression.'

'Although climate change is planetary, it is a mistake to think of it in global terms. Our students must learn to evaluate relative climate risk' (e.g. Florida vs. Haiti and the drastically comparative impact from hurricanes).

'We cannot teach climate change as if we were all equally at risk. Natural disasters wreck social, legal and political structures (such as water, sanitation and hygiene facilities), with climate resilience being most critical after disasters.'

2. Equipping young learners with climate competencies at Cambridge Primary and Lower Secondary

At Cambridge, we believe that early engagement with climate change education is crucial. Our Cambridge Primary and Lower Secondary programmes offer a unique opportunity to introduce learners aged 5 to 14 to the foundational knowledge, skills and attitudes necessary to understand and address climate-related challenges.

Building climate literacy from an early age

The Royal Meteorological Society believes that '...every student should leave school with the basic climate literacy that would enable them to engage with the messages put forward by the media or politicians, or to make informed decisions about their own opportunities and responsibilities when it comes to climate change mitigation and adaptation, and also to equip them with the knowledge and skills required for the green jobs of the future.'[3]

Embedding climate change education across our curriculum ensures that learners develop a comprehensive understanding of:

- **Climate change:** exploring the causes, particularly human-induced factors, and the science behind global warming.
- **Sustainability:** recognising the interconnections between climate change and sustainable practices, such as resource conservation and waste reduction.

This foundational knowledge empowers learners to make informed decisions and fosters a sense of responsibility towards the environment.

A geography framework that meaningfully embeds climate change education should support the development of a wide range of cognitive, practical and critical skills for learners such as:

- **Data and information literacy**
  Students should develop the ability to find, interpret and evaluate environmental data, including identifying accurate and up-to-date information. This lays the foundation for understanding complex issues like climate modelling, carbon footprints and biodiversity loss.
- **Critical and analytical thinking**
  Engaging with media messages, political claims and public discourse around climate change is vital. Geography lessons should build students' ability to assess claims, understand bias and evaluate sources – skills essential for informed decision-making.
- **Communication and creative expression**
  Students need subject-specific vocabulary to articulate concepts related to climate and sustainability. At the same time, geography can offer opportunities for creative expression, through storytelling, visual mapping or scenario-building, to process and convey climate-related ideas.
- **Fieldwork and inquiry skills**
  Even at the primary level, local fieldwork and observational studies can help students explore real-world climate and sustainability issues in their own communities. These practical experiences make abstract concepts more tangible and help students see the relevance of climate education in their lives.
- **Decision-making and systems thinking**
  Geography offers a unique opportunity to explore systems thinking, understanding how local actions relate to global consequences. Students can also learn how to weigh options and make decisions about personal actions, policy choices and collective responsibilities.

3. Equipping learners with climate competencies at Cambridge Upper Secondary

The geography classroom is a powerful space for climate change education, especially for learners aged 14 to 19. Our Cambridge Upper Secondary Geography curriculum is designed to go beyond theory, helping students connect geographical knowledge with real-world climate challenges, develop critical skills and foster a sense of responsibility towards the planet.

Fieldwork: geography in action

Fieldwork is an essential component of our geography syllabus, offering students hands-on experiences that bring environmental concepts to life. By engaging with their local environment, learners gain a practical understanding of geographical processes and the impact of climate change.

Our curriculum supports diverse fieldwork approaches, including:

- **Data collection in a changing climate:** Students apply geographical methods to gather, analyse and interpret environmental data.
- **Carbon footprint analysis:** Learners explore the geography of sustainability by calculating the carbon impact of various activities, such as local trips or everyday choices.
- **Using technology in geographical studies:** Students are encouraged to leverage digital tools, including artificial intelligence (AI), to develop data skills, enhance spatial analysis, and even practise basic coding skills that are increasingly relevant in geography and beyond.

Building competencies through geography

Our geography curriculum is not just about understanding climate change, it is about empowering students to critically engage with it. Several key teaching strategies help teachers deliver impactful climate change education, including:

- **Solutions-oriented learning in geography:** Students apply their geographical knowledge to real-world problems, such as designing 'living labs for sustainability', fostering a sense of agency that reduces climate anxiety.
- **Creative approaches to geographical understanding:** Through storytelling, scenario-building and problem-solving, students explore climate concepts in ways that enhance critical thinking.
- **Innovative assessments in geography:** Project-based evaluations and field reports allow students to demonstrate their understanding of climate issues beyond traditional assessments.
- **A participatory learning environment:** Our geography classrooms encourage active student participation, where learners can debate, collaborate and take ownership of their learning journey.

By embedding climate change education within our geography curriculum, we ensure that students not only acquire essential geographical knowledge but also develop the skills and values needed to become informed, responsible global citizens.

Key insights from the Geography Convocation continued

4. Supporting geography teachers at primary and lower secondary levels

For teachers working with younger learners at primary and lower secondary levels, developing confidence in teaching climate change begins with effective communication skills.

Building confidence through oracy and dialogue

Teachers can enhance student engagement and understanding through oracy, which involves linguistic, social and physical elements. Key strategies include:

- establishing ground rules for class discussions, such as assessing evidence, weighing perspectives and maintaining respectful dialogue
- encouraging students to elaborate on their thoughts (e.g., 'Can you tell me a bit more about that?') and to ask questions of one another
- promoting active participation from all students, ensuring diverse voices are heard
- creating a democratic classroom environment where students actively contribute to discussions.

Practical classroom activities

To bring climate change education into a local context, teachers can use practical, accessible activities such as:

- local field trips i.e., exploring sustainability in local parks and farms
- classroom-based projects like mapping the origins of food items or conducting surveys on how to make the school more sustainable
- creative tasks like designing eco-friendly features for buildings or creating wellbeing maps of the school.

Curriculum design

The curriculum should allow space for dialogue and ask learners for their views. The role of the teacher is not to know everything but to facilitate conversation and give learners the opportunity to explore, discuss, and bring ideas back to the classroom.

Teachers can further enhance their confidence and effectiveness through well-structured curriculum design and planning. Key approaches include:

- integrating oracy into classes and using debate clubs to foster critical thinking and listening skills
- encouraging student congresses, where students voice their opinions and senior leadership considers their ideas
- strengthening curriculum progression by building relationships with local secondary schools, ensuring primary and lower secondary learners are prepared for the next stages in their learning.

Access to quality resources

Teachers should be given professional development opportunities and equipped with flexible, high-quality resources that support their teaching goals. Recommended resources include:

- **Thinking Together materials from the Faculty of Education (dialogic teaching support)**[4]
- **Oxfam: The Human impact of climate change: Resources for Primary schools**[5]
- **Geographical Association** website[6]
- **Teach the Future** website[7]
- **British Council website: Climate resources for school teachers**[8]
- **NASA educational resources**[9]

5. Supporting geography teachers at upper secondary level

Teachers recognise the importance of climate change education but often report feeling underprepared to teach it. They often lack training and support for covering new curricula or engaging with the interdisciplinarity of climate change education.

To teach climate change education effectively within the geography curriculum, teachers require a blend of skills, resources and approaches that enable them to confidently connect global challenges to local contexts. This section outlines the key elements needed for teachers to achieve this goal.

Building teacher confidence

Teachers can gain confidence in integrating climate change education by focusing on place-based learning approaches. Fieldwork, particularly for the 14 to 19 age group at Cambridge Upper Secondary level, serves as a vital method for developing geography-specific and transferable skills. Such experiences allow students to engage directly with their local environment's biology and history, making abstract global issues more tangible. Examples of fieldwork activities that support this include:

- conducting data collection to observe the impacts of a changing climate
- assessing the carbon footprint of various trips to understand travel impacts
- using AI as a productive tool, enabling students to acquire coding skills related to climate analysis.

Effective teaching approaches

Embedding climate change education effectively requires a focus not only on content but also on how students learn. Key teaching strategies include:

- solutions-oriented learning, where students apply knowledge to real-world situations, fostering a sense of agency and reducing climate anxiety
- creative pedagogies that develop sustainability competencies, encouraging critical and innovative thinking
- creative assessment methods that go beyond traditional exams and include project-based or experiential evaluations
- a democratic learning environment, where students are active partners in their learning journey.

Competencies for sustainability

Teachers should also be familiar with the competencies outlined in the Quality Assurance Agency (QAA) and Advance HE report, Education for Sustainable Development Guidance (2021)[10], which builds on UNESCO's sustainability competencies framework (2017)[11]. These competencies are categorised as follows:

- **Ways of thinking:** systems thinking, anticipatory or future thinking and critical thinking.
- **Ways of practising:** strategic thinking, collaboration and integrated problem-solving.
- **Ways of being:** self-awareness and values-based (normative) competencies.

Access to quality resources

Teachers must have access to high-quality, evidence-based resources that enhance their ability to deliver climate change education. Recommended resources include:

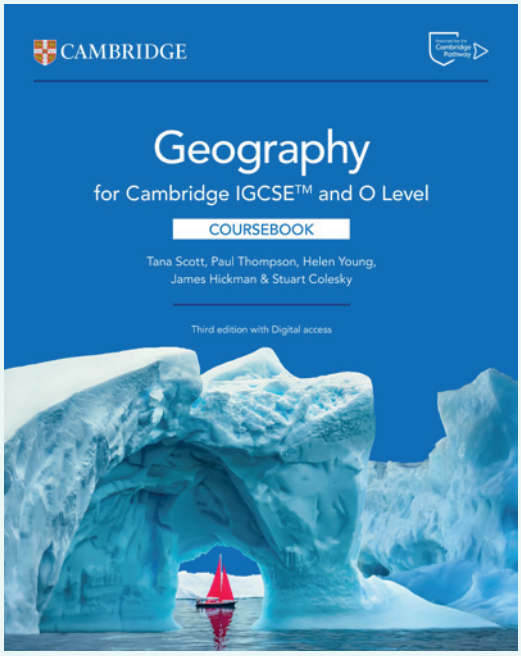
- Enhancing Fieldwork Learning. Enhancing Fieldwork Learning website. (**www.enhancingfieldwork.org.uk**)[12], offering guidance and best practices for effective fieldwork.
- Intergovernmental Panel on Climate Change (IPCC). 2021. Nature-based solutions for climate change mitigation. **www.ipcc.ch**[13]
- British Ecological Society. 2022. Nature-based solutions for climate change in the UK. **www.britishecologicalsociety.org**[14]

By ensuring teachers are equipped with resources and teaching methods, climate change education can become an integral, impactful part of geography lessons, empowering students with the knowledge and capabilities to address global environmental challenges at a local level.

6. Embedding climate change education in Cambridge published resources

Cambridge IGCSE and O Level Geography Coursebook[15]

In March 2025, we updated our Geography for Cambridge IGCSE™ and O Level Coursebook. The updated coursebook now includes a dedicated chapter on climate change and is divided into different sections – geographical skills, geographical themes (physical geography and human geography), geographical enquiry and preparing for assessment. The themes of climate change and sustainability are interwoven throughout the topics to enable students to develop their awareness of these important and challenging world issues, and to grow into global citizens.



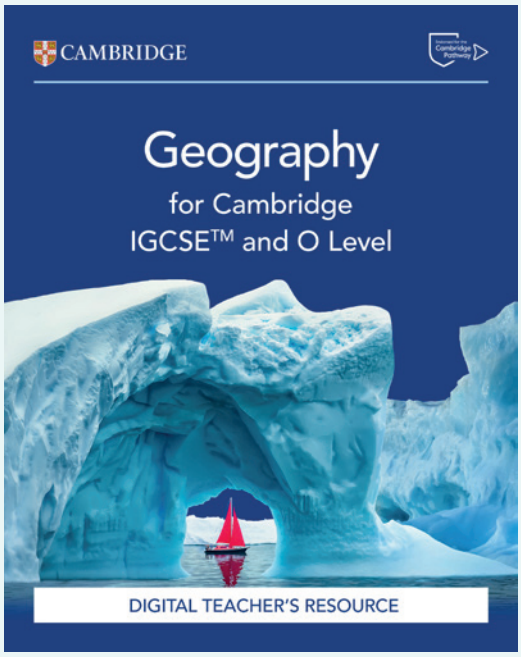
The dedicated chapter on climate change has the following sub topics:

- causes of climate change
- the impacts of climate change
- managing climate change
- detailed specific example on India.

The chapter includes a number of learning tools to develop learning and encourage conversation, including projects, detailed specific examples, activities and more.

Cambridge IGCSE and O Level Geography Teacher's Resource[16]

Different regions and schools may have varying levels of knowledge and exposure to the impacts of climate change. The wealth of support for the climate change chapter in the teacher's resource will mean a less experienced teacher teaching climate change will have all the tools to approach it confidently. It contains a learning plan, common misconceptions, teaching ideas, differentiation ideas, assessment ideas, step-by-step guidance on running a debate on climate change, an interactive game, support on teaching the Detailed Specific Example, worksheets, an end-of-topic test and answers.



Key insights from the Geography Convocation continued

7. Broader competencies for climate-literate learners

In addition to subject-specific skills, geography can support the development of wider competencies that will serve students throughout their education and beyond:

- **Lifelong learning and adaptability**

Students should be encouraged to see knowledge as evolving. Teaching should model how to question sources, keep learning and adapt their understanding as new information emerges, skills that are essential for navigating a fast-changing climate landscape.

- **Political literacy**

Embedding early, age-appropriate exposure to climate-related policy tools, such as local initiatives, carbon pricing or youth climate movements, helps students understand their role to act in the face of global issues. This can also help mitigate climate anxiety by focusing on action and solutions.

- **Creativity and imagination**

Alongside scientific education, there is value in nurturing students' imagination in terms of climate and sustainability understanding, helping them envision and design better futures. Geography can offer space for exploring hopeful and inspiring responses to climate challenges.

Key insights from the Geography Convocation continued

8. Lesson activities for primary and secondary students

Example A: Systems thinking and scientific foundations

- **Primary and Lower secondary:** Introduce oceans as climate regulators using NASA's visualisations (e.g., My NASA Data Explorer). Students map local water systems to understand the connections between different parts of the water cycle (e.g. local rivers, reservoirs and oceans). Discuss the ways that humans can affect those parts of the cycle[17].
- **Upper Secondary and Advanced:** Cambridge IGCSE units explore ocean dynamics through data analysis tasks, such as graphing carbon sequestration rates. Cambridge International A Level students model systems interactions (e.g., urban heat vs. green spaces) using open-source tools like Google Earth Engine.

Example B: Intersectionality and social justice

- **Primary:** Storytelling activities explore climate impacts on diverse communities (e.g., Tuvalu's adaptation challenges[18]), encouraging empathy and critical thinking.
- **Secondary:** Case studies compare climate risks (e.g., Florida vs. Haiti hurricanes[19]), with assessment tasks analysing power dynamics. Students debate local vs. global mitigation strategies, referencing United Nations (UN) frameworks.

Key insights from the Geography Convocation continued

Example C: Fostering agency through action

- **Primary:** Students design community rewilding projects, presenting plans to peers. Resources include templates for mapping local biodiversity, inspired by nature-based solutions contributing 30–37% of mitigation needs[20].
- **Secondary:** Cambridge IGCSE students develop climate action proposals (e.g., urban green corridors), assessed for feasibility and impact. Cambridge International A Level tasks simulate UN climate negotiations, emphasising the agency of small island states.

Example D: Fieldwork and place-based learning

- **Primary:** Virtual fieldwork explores local ecosystems via Google Earth, supplemented by schoolyard surveys to study microclimates.
- **Secondary:** Cambridge IGCSE fieldwork measures local carbon sinks (e.g., urban parks), using open-access radar data from the European Space Agency. Cambridge International A Level students conduct comparative studies (e.g., coastal erosion rates), linking findings to global trends.

Recommendations

The insights from the Geography Convocation is shaping Cambridge geography curricula and our support for schools.

Cambridge is working to embed climate change education across the full Cambridge Pathway, ensuring content reflects research and inspires action. The most recent changes to our curricula integrate climate themes into core subjects from geography to accounting, environmental management, and business studies. During the Geography Convocation, participants noted opportunities to enhance multidisciplinary approaches to climate change, linking geography with history, policy and science so that learners see it beyond a single subject.

For Cambridge Primary, Lower Secondary and Upper Secondary learners, fieldwork is recommended as a way to develop both geography-specific skills and transferable skills, supporting subject-focused and more general competencies. Local fieldwork is highlighted as a powerful example of using place-based learning to connect students with their local area's biology and history.

Education plays a clear role in developing well-informed citizens who can make a positive difference in their communities and act as agents of change. This report recommends that climate change education should start from a young age. In geography, students have a real opportunity to develop a range of skills that will help them understand climate change in their contexts and see how local actions can lead to global change.

In the classroom, there is recognition that not all teachers feel prepared to teach climate change. Therefore, the right tools, resources and knowledge should be provided to encourage teachers to feel confident in equipping learners with the knowledge, skills and initiative to address the climate crisis. Join our research community on climate change education to help us understand more about the themes and issues that matter most to you. **https://www.cambridgeinternational.org/why-choose-us/benefits-of-a-cambridge-education/climate-change-education/join-our-research-community-on-climate-change-education/**

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Further information and contacts

These Convocation events are designed to catalyse a knowledge exchange across the University of Cambridge in the form of collaborative dialogue. The overarching objective is to build understanding and drive age-appropriate climate and sustainability education through Cambridge University Press & Assessment qualifications, assessment and teaching and learning materials. We aim to identify links between Cambridge OCR and Cambridge International Education products and services, and creative and innovative sustainability- and climate-related thinking and research.

Many thanks to all participants at this event for the contributions that led to the development of this paper.

If you are interested in learning more:

- Read the Engineers 2030 report (published March 2024) – a policy project led by the Royal Academy of Engineering on behalf of the National Engineering Policy Centre: **nepc.raeng.org.uk/engineers-2030**
- Explore the Cambridge University Press & Assessment climate education web pages: **www.cambridge.org/people-and-planet/climate-change-education**
- Read **Empowering learners through climate change education** – an introduction paper published by the International Education group at Cambridge University Press & Assessment – **www.cambridgeinternational.org/Images/707181-climate-change-education-introduction-paper.pdf**
- Find out about the work of Cambridge Zero: **www.zero.cam.ac.uk**

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