Evaluation of the Impact of the 1.5 MAX Initiative on Climate Change Education (CCE) in Malawi Secondary Schools: An Education for Sustainable Development Framework Approach

Tianshu Chen
University of Edinburgh

Debojyoti Das
University of Edinburgh

This qualitative case study evaluates the impact of the 1.5 MAX initiative on Climate Change Education (CCE) in Malawian secondary schools through the dual lens of Education for Sustainable Development and decolonial theory. Malawi's curricula prioritize Western agricultural models over Indigenous knowledge, resulting in fragmented implementation due to teacher training gaps, resource shortages, and a stark divide between students' climate knowledge and actionable engagement. While the 1.5 MAX initiative enhances climate awareness and practical skills through interactive methods, its effectiveness is constrained by limited teacher preparedness, curricular misalignment, and systemic resource limitations. The research highlights the importance of integrating Indigenous knowledge and adapting content to local contexts for greater relevance and effectiveness. By applying a decolonial lens, this research critiques the dominance of Western epistemologies in global educational initiatives and advocates for the co-creation of knowledge that centers local agency and context-specific solutions. While demonstrating the potential of international educational initiatives to complement local curricula, the study underscores the need for sustainable support systems and expanded teacher training. Future research should assess the long-term impacts of such interventions and explore strategies for aligning global practices with local needs, while dismantling colonial legacies to foster a more equitable and inclusive educational landscape.

Keywords: Climate change education, Education for sustainable development, decolonial framework, Malawi, 1.5 MAX initiative, teaching and learning support.

Introduction

Climate change is one of humanity's most pressing challenges, spanning across ecological, economic, political, and social scales (Anderson, 2012; Gardiner, 2011). These impacts are acute in Malawi, a landlocked country in southeastern Africa whose vulnerability stems from its heavy reliance on rain-fed agriculture and systemic limitations in adaptive capacity (Ziervogel et al., 2014). Ranked among the five countries most affected by climate change in East Africa (World Bank Group, 2022), Malawi contends with recurrent climate-driven disasters—including floods,

droughts, and tropical storms—that destabilize livelihoods, displace communities, and strain an already fragile economy. Over 80 percent of the population depends on subsistence agriculture compounding this vulnerability, and leaving food security and household incomes acutely exposed to erratic weather patterns (Nangoma, 2007). Prolonged droughts devastate maize crops, which are a vital economic and food resource in Malawi (World Food Programme, 2024). Deforestation exacerbates climatic challenges, as 95 percent of households depend on wood or charcoal for fuel (World Bank, 2022).

Addressing climate change-induced disruption requires technological and financial solutions as well asstructural, cultural, and behavioral reforms (Hoffman, 2010; Liverani, 2009). Education plays a critical role in fostering these changes (Wals & Benavot, 2017). The United Nations (UN)' Sustainable Development Goal (SDG) 13 (Climate Action) underscores education's importance in mitigating climate change impacts, fostering adaptability, and promoting sustainable development (UN, 2015). The United Nations Educational, Scientific and Cultural Organization (UNESCO) (2022) highlights that climate change education (CCE) can enhance individual and community resilience while driving societal transformation. Other research shows that educated populations are better equipped for sustainable behaviors and climate innovations (Piao & Managi, 2023).
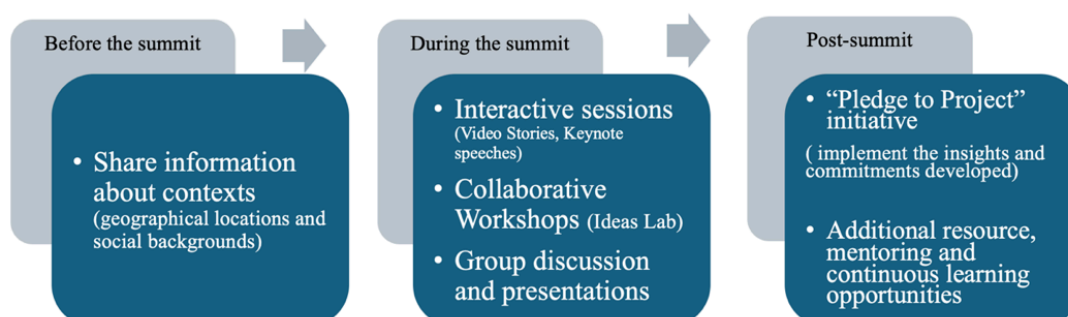
CCE in Malawi
The Malawian government has prioritized CCE since the 1986 African Ministerial Environment Conference, at which time the government integrated it into educational systems (Nampota, 2011). Recent efforts include the revised Climate Change Learning Strategy (Malawi Government, 2021), aimed at implementing a nationwide comprehensive CCE approach. However, gaps remain, such as limited integration of climate change topics across certain grades and subjects including primary, secondary and universities with different stratigies (Malawi Government, 2004; Mataya et al., 2020). International organizations, including the World Bank Group and the UN Development Program (UNDP)recognize these gaps and have taken measures to address them through projects like TRANSFORM and Ripple Africa, which enhance community resilience and conservation education (Ripple Africa, 2024; World Bank Group, 2022).

One initiative addressing these gaps is the 1.5 MAX initiative, launched in 2021 by Sustainable Partnerships, Learning for Sustainability Scotland, and the British Council (1.5 MAX, n.d.). This international program connects schools in Scotland with those in climate-vulnerable countries like Malawi and Nepal, fostering equitable and inclusive collaboration on addressing climate-related challenges. In Malawi, where extreme weather events such as cyclones, floods, and droughts pose recurring challenges, the summit emphasizes the urgent need for climate education and youth-led adaptation. This initiative (see Figure 1) combines in-class and online activities. Guided by local teachers, students identify local climate challenges and present their solutions online to global teams. These presentations are evaluated and guided by global professors, fostering a rich exchange of knowledge and strategies

(1.5 MAX, n.d.). After, schools implement community-based projects, empowering students and educators to contribute to local climate resilience and sustainability.

Figure 1
1.5 MAX initiative process

Note. Author's elaboration, based on 1.5 MAX Website (1.5 MAX, n.d.)

Having operated since 2021, the 1.5 MAX initiative provides a valuable opportunity to assess the impact of a climate initiative on CCE in Malawi and to identify future challenges. Building on this context, this paper evaluates the effectiveness of the 1.5 MAX initiative in enhancing CCE in Malawi's schools using an Education for Sustainable Development (ESD) framework. The study addressed the following questions: How does the 1.5 MAX initiative affect CCE in Malawi's secondary schools from educators' and students' perspectives? And w hat are the implications for future CCE enhancement in Malawi's secondary schools?

Literature Review
The notions of Climate Change Education and Education for Sustainable Development provide the foundational framework for this study.

CCE and ESD
CCE is critical for fostering resilience and societal transformation, yet its implementation faces barriers, including inconsistent teaching objectives, cultural and ideological resistance, outdated pedagogical methods, and community skepticism (Kolleck et al., 2017; Monroe et al., 2013; Nayan et al., 2020). The implementation of CCE has yet to meet urgent needs with unclear definitions and inconsistent methods (Fernandez et al., 2014; Nambiar & Sarabhai, 2015). While efforts to define its core skills and competencies exist (Mochizuki & Bryan, 2015), consensus on effective approaches remains elusive (Bushell et al., 2017). To address these challenges, scholars emphasize the need for strategies that prioritize student-centered learning and personally relevant content, ensuring climate education resonates with learners' lived experiences and motivates actionable engagement (Monroe et al., 2019).

These principles align closely with the broader goals of ESD—a framework rooted in the 1977 Tbilisi Declaration and refined through initiatives like Agenda 21 (UN, 1992)

and UNESCO's Decade of Education for Sustainable Development (2005–2015). ESD integrates environmental, economic, and social dimensions of sustainability (Corney & Reid, 2007), aiming to empower individuals and institutions through knowledge, skills, and values (Molthan-Hill et al., 2019; Pauw et al., 2015). It promotes values-based education (Dahl, 2012), critical thinking (Stevenson, 2007), and cognitive development (Sterling, 2011). Recent adaptations like ESD 2023 stress actionable and localized education for achieving the Sustainable Development Goals (SDGs) (UNESCO, 2020). ESD serves as a strategy to evaluate educational impact of CCE, emphasizing tangible outcomes like emission reductions and enhanced sustainable actions (Barth & Michelsen, 2013; Kioupi & Voulvoulis, 2019).

The United Nations emphasizes the need to empower societies through education, training, and collaboration (United Nations Climate Change, 2023). Mochizuki and Bryan (2015) focus on integrating climate themes into curricula to foster knowledge and behavioral change. This study adopts the latter definition, which highlights emotional well-being as central to behavioral change. By bridging CCE's practical challenges with ESD's systemic approach, these insights provide theoretical grounding for evaluating programs like the 1.5 MAX initiative and underscore the necessity for integrated, context-sensitive educational strategies to drive meaningful climate action.

In this paper, ESD functions as an assessment tool to evaluate the 1.5 MAX initiative within the Climate Change Education for Sustainable Development (CCESD) framework proposed by Mochizuki and Bryan (2015).

Integrate CCE within ESD
ESD addresses sustainability across social, economic, and environmental dimensions, while CCE specifically targets climate adaptation and mitigation (Mochizuki & Bryan, 2015). Mochizuki and Bryan (2015, p. 9) argue that because "CC encompasses environmental, political, social, and economic factors, the holistic framework of ESD is an optimal framework to advance CCE." This integration is critical because ESD encompasses climate–related knowledge and cultivates critical thinking and problem-solving abilities, and sustainable living behaviors (Anderson, 2012; Thomas, 2009; UNESCO, 2011). ESD emphasizes the institutional context in which this education occurs, ensuring that educational environments are resilient and proactive in promoting sustainable development (UNESCO, 2020).

By embedding CCE into ESD, learners may acquire a comprehensive understanding of climate change drivers, impacts, and solutions. Desha and Hargroves (2011) claim that this approach enhances climate literacy while empowering learners to share adaptation and mitigation strategies within their communities (Laurie et al., 2016; Schreiner et al., 2005). ESD leverages the multiplier effect of education, enabling learners to extend the benefits of their knowledge to their entire families and communities (Kioupi & Voulvoulis, 2019; Oranga et al., 2023). What is more, Lozano et al. (2022) show that ESD teaching methods improve skills and knowledge related to Climate Change and trigger positive emotions within students.

Empirical studies demonstrate the tangible impacts of integrating CCE with ESD. Pauw and colleagues (2015) present direct evidence of the positive effects of ESD, showcasing its capacity to foster students' awareness and behaviors of sustainability. These outcomes are amplified through models like the whole-school approach, which fosters student engagement and institutional sustainability (Davis, 2006). However, challenges persist. Kopnina (2014) critiques ESD's broad scope for diluting ecological priorities, risking ambiguous interpretations that may overshadow climate urgency. Uneven implementation—driven by insufficient teacher training, lagging curriculum updates, and weak policy support—undermines ESD's potential in regions like Africa (Manteaw, 2012; UNESCO, 2020; Vare & Scott, 2007).

Contextual Framework: Curricular Gaps and Student Engagement in Malawi

Malawi's CCE curricula reflect a tension between international influence and local realities. While supported by global stakeholders like USAID, educational content remains shaped by colonial legacies that prioritize utilitarian, human-centric narratives, oversimplifying environmental issues and disproportionately assigning responsibility to rural communities over systemic actors (Gyamera & Burke, 2018; Ress et al., 2022). Indigenous Knowledge—despite its proven efficacy in climate adaptation (Attoh et al., 2021), remains underutilized in Malawi's CCE. The agriculture curriculum promotes large-scale production systems reliant on synthetic fertilizers and pesticides, which contribute to soil degradation and water pollution. Although Malawi's Climate Change Learning Strategy (2021) expands CCE into formal and informal sectors, implementation is hindered by fragmented curricula, resource shortages, and uneven teacher training (Nampota, 2011).

These structural gaps correlate with stark disparities in student outcomes. Only 43.1% of Malawian secondary students demonstrate basic climate literacy, while 66.9% report no participation in mitigation activities like waste management or drought-resistant farming (Kutywayo et al., 2022; Wadson et al., 2023). These gap mirror trends in neighboring countries (Kutywayo et al., 2022) and underscore the limitations of theoretical, classroom-centric approaches (Wadson et al., 2023).

Latent potential exists: 73.4 percent of students express heightened climate concern, and 70.3 percent seek actionable engagement (Wadson et al., 2023). Successful models like Egypt's Green Schools Initiative and New Zealand's Enviro-schools Programme demonstrate how integrating environmental education with practical applications enhances engagement and outcomes (Eames & Mardon, 2020; Okasha et al., 2016). These findings highlight the potential for CCE to harness students' awareness and willingness to act.

A Decolonial Lens for Evaluating CCE: Integrating CCESD and Mignolo's Framework

The CCESD framework (see Figure 2), developed by Mochizuki and Bryan (2015), provides a more detailed description of essential competencies. It extends beyond

imparting knowledge to developing the capability to transform this knowledge into actionable measures. The framework's emphasis on integrating local and Indigenous knowledge into CCE adds another layer of relevance, ensuring the education is culturally appropriate and enhances its effectiveness across different geographical and cultural contexts. The framework is structured around 4 pillars of learning outcomes (learning to know, to do, to live, and to be), making it pertinent for evaluating CCE interventions, such as the 1.5 MAX initiative.

Figure 2
Climate Change Education for Sustainable Development Framework
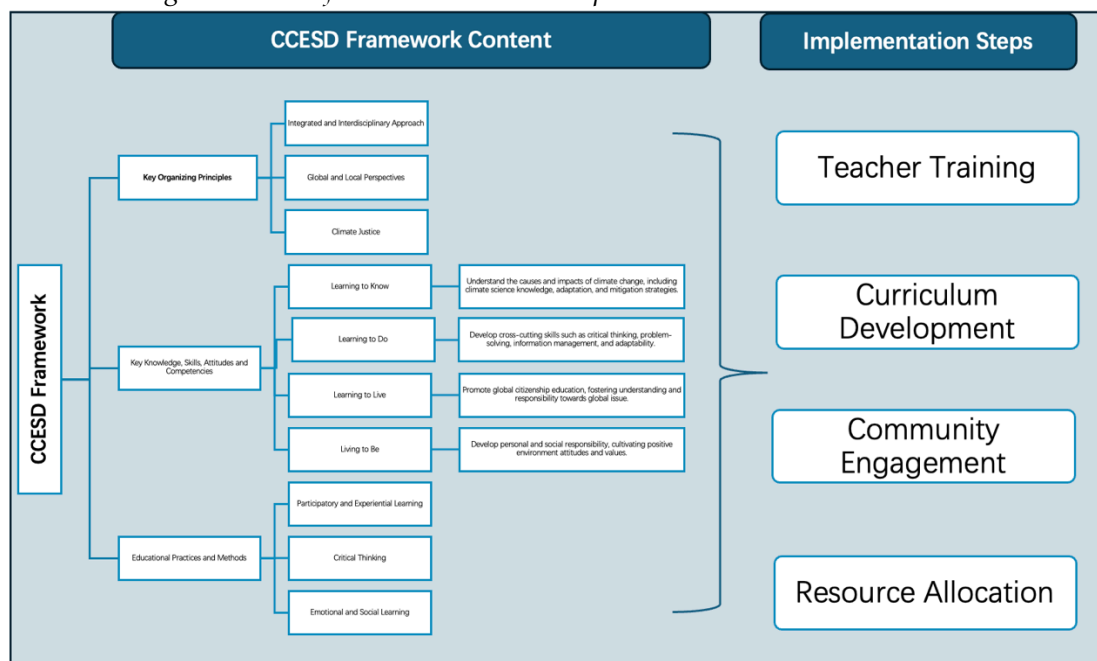
Note. Author's elaboration, based on Mochizuki and Bryan (2015).

The CCESD framework offers a practical structure for evaluating competencies and learning outcomes, incorporating the decolonial framework built by Mignolo (2007), which provides a critical lens to examine the systemic power dynamics and epistemological biases underlying CCE (Zavala, 2016). The concepts of coloniality of power, knowledge, and critique of global education initiatives, such as 1.5 MAX, may inadvertently perpetuate Eurocentric narratives while marginalizing Indigenous perspectives (Seroto, 2018). By combining CCESD's emphasis on competencies with decolonial critique, this study adopts a dual framework that evaluates the content and context of CCE interventions.

Data and Methodology
This study employs a multi-case evaluative design to address the complexities of the 1.5 MAX intervention, enabling diverse data collection methods, including in-depth interviews with teachers and students and systematic policy analysis. The inclusion of multiple cases provides comparative insights and enhances the generalizability of findings within Malawi's educational context (Patton, 2014).

Policy Analysis

To accurately assess the effectiveness of the 1.5 MAX initiative in Malawi, it is crucial to possess an in-depth understanding of the existing CCE within the country. Policy documents provide valuable insights into historical and educational contexts. As Mason (2017) asserts, documents are "constructed in particular contexts, by particular people, with particular purposes, and with consequences – intended and unintended" (p. 110); rendering them as key resources for providing background information on a research environment (Silverman, 2005).

To ensure relevance and reliability, a criterion sampling method was used to select documents aligned with Scott's (2014) quality criteria. The selected documents had to be officially issued by the Malawi Government or the Malawi Institute of Education (MIE), published within the last decade, and explicitly reference climate education. The following three key documents were analyzed: The Malawi Institute of Education (MIE) Strategic Plan 2020 to 2025: Focuses on enhancing curriculum design and evaluation, emphasizing CCE-related aspects (MIE, 2023), and the Syllabus (2013) from the Ministry of Education of Geography: Details curriculum content and pedagogical approaches for CCE, highlighting expected learning outcomes at various levels.

Interviews

Interviews are crucial for understanding individual experiences and the broader contexts in which they occur (Seidman, 2006). They facilitate researchers to construct a relatively comprehensive picture of the communities and cultures involved (Holstein & Gubrium, 1995; Powney & Watts, 2018). For this research, semi-structured interviews were conducted to gather insights into educators' and students' perceptions of the 1.5 MAX initiative.

Purposive sampling was used to select four schools, Community Day Secondary Schools and private schools, from diverse regions such as Blantyre in the south and Karonga in the north (see Figures 3 and 4). Teachers directly involved in the initiative were interviewed, and snowball sampling was used to select participating students (Marcus et al., 2017). In total, eight interviews were conducted, each lasting about 40 minutes and covering 10 structured questions based on the CCESD framework. Additional probes were used to deepen the dialogue. All interviews were audio-recorded with participants' consent and subsequently transcribed.

Figure 3
List of participants

Name	Gender	Location	Role/Academic Level	Year in Program
Teacher1 - T1	Male	Mzuzu	Head of Science Department	Second Year
Teacher2 - T2	Male	Karonga	Physics and Chemistry Teacher	Second Year
Teacher3 - T3	Male	Blantyre	Physics Teacher	First Year
Teacher4 - T4	Female	Kasungu	Physics Teacher Climate Activist	Second Year
Student1 - S1	Male	Mzuzu	Form 2	First Year
Student2 - S2	Female	Kasungu	Form 4	Second Year
Student3 - S3	Male	Karonga	Form3	Second Year
Student4 - S4	Female	Blantyre	Form 4	First Year

Figure 4

Research area in Malawi
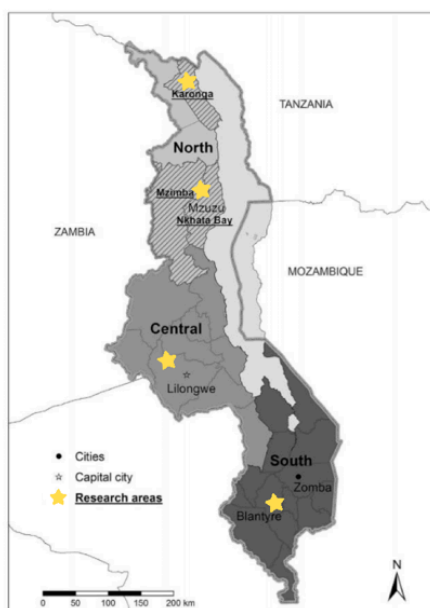
Note. Author's elaboration, based on the Malawi Spatial Data portal MASDAP (2012).

Data Analysis: Reflexive Thematic Analysis

I employed reflexive thematic analysis (RTA), emphasizing the researcher's reflective engagement with the data (Braun & Clarke, 2019, p. 594). This flexible approach incorporates deductive and inductive coding strategies. This analysis adhered to a systematic six-phase approach (Barth & Michelsen, 2013; Braun & Clarke, 2021), beginning with familiarization and systematic coding. The CCESD framework guided my deductive coding (Mochizuki & Bryan, 2015), establishing foundational themes linked to its dimensions (e.g., Learning to Know) (see Figure 5).

Figure 5

Deductive codes

Framework Dimension	Evaluation Themes in CCESD	Linked Themes in Research	Foundational Code
Learning to know	Knowledge of Climate Science	Teacher/student initial understanding about CCE and ESD	Understand simple climate issues
			Analyse climate patterns and effects
			Engage in complex climate modeling and predictions
	Mitigation and Sustainable Consumption	Adaptation and Mitigation Strategies	Basic Recycling and Conservation
			Sustainable Lifestyle Practices
			High-Impact Mitigation Strategies
	Adaptation and Disaster Risk Reduction (DRR)	Climate Awareness and Problem Identification	Understand personal and local preparedness
			Community-Based Adaptation Strategies
			Systems-Level Resilience
	Knowledge of Local Conditions	Curriculum Related to Local Context	Recognize local climate issues
			Assess the impact of local activities
			Manage and mitigate local challenges

Note. The author's elaboration is based on the CCESD framework.

Inductive coding allows for the emergence of new themes or refined sub-themes not initially anticipated by the framework (Figure 6). Subsequent steps include refining these themes to ensure they accurately represent the dataset and compiling a comprehensive report that integrates the findings and discussion.

Figure 6
Inductive Codes

Evaluation Themes in CCESD	Themes in Research	Code	Transcript
Knowledge of Climate Science	Teacher initial understanding about CCE and ESD	Understand simple climate issues	"When looking at education for sustainable development, we aim to impart knowledge to our students on how to sustain the biodiversity of the earth" (T4).
			"I understand that we have climate change" (T2). "It's about how to mitigate or adapt to these changes" (T4).
			"the importance of education in imparting crucial knowledge about climate change" (T3).
		Difficulty in Defining Objectives	"It's difficult to define specific objectives for climate change education unless the school has an organization or society that focuses on this"(T1).
		Analyse climate patterns and effects	"We aim to impart knowledge to students about the effects of climate change" (T4). "We focus on the impact of human activities on the environment" (T2).
		Engage in complex climate modeling and predictions	N/A
		Recognizing the importance of CCE and ESD in the curriculum	"Education for sustainable development ensures that all aspects in different subjects are interconnected" (T3). "This type of education equips learners with knowledge for sustainability" (T1).

Note. Analysis based on deductive codes and interview data.

Analytical Framework

The CCESD framework employs the four pillars (as shown in Figure 3) defined in the Delors (1996) Report about the education capacities for the 21st Century (Mochizuki & Bryan, 2015). This study will specifically concentrate on two fundamental aspects: Learning to Know and Learning to Do. In the **Learning to Know** pillar**,** learners should acquire an adequate understanding of the origins and consequences of CC, alongside the necessary tools for mitigation and adaptation. In the **Learning to Do** pillar, students should acquire interdisciplinary skills, such as emotional intelligence to handle anxiety, adaptability to different contexts and educational settings, understanding of complex system dynamics, and the ability to envisage alternative futures and solutions.

Results and Discussion

This section analyzes how the 1.5 MAX initiative influences CCE in Malawi through the CCESD framework. Based on policy documents and interviews, it explores the initiative's impact on learning outcomes.

Learning Outcomes: Learning to Know

An analysis of the interview data and curriculum syllabus found that students and teachers in Malawi possess a superficial understanding of climate change-related knowledge. Teachers admitted, "they didn't have the idea about the mitigation and adaptation before they joined in this activity" (T2). This ambiguity extends to students' responses, indicating a general but unclear understanding of the terms. When asked about their comprehension of CCE, teachers responded:

> When looking at climate change, we aim to impart knowledge to our students on how to sustain the biodiversity of the earth (T1).

> I understand that we have climate change (T2).

> The importance of education is imparting crucial knowledge about climate change (T3).

> A way of teaching students how they can conceive the problem and how students can be aware of the issues concerning the environment (T4).

Students were asked about the idea of mitigation and adaptation. They responded:

> I feel I do have that idea (S2).

> The main strategies that have come across are planting trees and proper waste management. It involves adopting a mindset to change the future and helps in controlling climate change in our schools (S3).

Research undertaken by Wadson et al. (2023) highlights a similar educational shortfall, pinpointing specific deficiencies in knowledge among senior secondary school students in Malawi. Similarly, Falaye and Okwilagwe (2016) found low levels of knowledge about CC mitigation and adaptation in Nigerian secondary schools, with students unable to differentiate between these two terms.

Figure 7

Sustainable Development element in the syllabus

Core Element	Form 1	Form 3	Form 4
Sustainable development	Socio-economic development • Family needs and resource management	Types of development • Political development • Social development • Economic development	Sustainable development • Meaning • Importance • Conditions for sustainable development • National and international sustainable development initiatives

Note. The Geography Syllabus (2013) was disseminated among the educators interviewed for this study.

This finding is crucial because mitigation and adaptation are essential components of CCE. Despite the secondary education outcomes in the overview of the secondary syllabus, which indicate that students should 'demonstrate the ability to adapt to climate change and mitigate its impact on the economy and environment' (Social Studies Syllabus, p. ix), the lack of explicit curriculum requirements has resulted in these vital aspects being overlooked in teaching. The Social Studies syllabus connects sustainable development with socio-economic and other types of development (Figure 7), emphasizing a prioritization of economic growth. This focus reflects aspirations in the Global South to achieve development, asserting their right to pursue such progress through education against a backdrop of historical marginalization, colonial exploitation, and ongoing neo-colonial influences in the post-colonial era (Singh, 2020; Tikly, 2019). However, the emphasis on economic growth in the curriculum reflects the coloniality of knowledge (Mignolo, 2007), where Western-centric development paradigms dominate, marginalizing Indigenous and local knowledge systems. The syllabus frames nature as a resource to be managed for human benefit, reinforcing a Eurocentric, anthropocentric worldview. This perspective perpetuates Descartes's dualism, separating humans from nature and prioritizing exploitation over ecological harmony (Mazzocchi, 2016).

The 1.5 MAX initiative has offered insights to students. Educators noted improvements in students' understanding of environmental issues, "Now they can understand these things, it helps them come up with solutions" (T4). Students' responses to CC questions demonstrated their grasp of the causal relationships in the local climate crisis, such as "When heavy rains come, people living by the lake are greatly affected. Floods cause many waterborne diseases" (S2). There is a variation in the depth of understanding across different topics. Compared to more complex systemic issues, students find it easier to understand direct impacts. Students perceive CC challenges as revolving around tree planting, stating that:

> We can protect the environment here. It's just about finding out how to get some tree seeds (S4).

> In the books, they just mention trees and say we shouldn't burn them (S1).

> They rely on the trees for their livelihood, so stopping them is challenging (S3).

The finding aligned with the UNESCO (2012) report entitled 'Education Sector Responses to Climate Change', that while CC concepts are present in the majority of curricula, the approach is superficial. The emphasis tends to be on individual actions, which overlooks the broader societal forces driving CC.

Engagement in the 1.5 MAX initiative has provided students with knowledge for CC adaptation and disaster risk reduction. This sharply contrasts with the findings of Kutywayo et al. (2022, p. 3), who reported that only 38.5 percent of learners in South Africa acknowledged that climate events such as heat exposure or droughts had

affected their lives. In Malawi, after attending the 1.5 MAX initiative, students could articulate the interplay between human actions and CC, a knowledge advancement aligning with Wadson et al.'s (2023a, p. 77) interpretation that "this may be a result of what the learners in Malawi are experiencing regarding the effects of CC."

Educators have highlighted a disconnect between classroom learning and community action, observing that "most students seem to forget what they learned in school" (T2). This observation aligns with the findings of Falaye and Okwilagwe (2016), who noted that a deep understanding of CC can influence learners' attitudes toward it. In response to this challenge, the 1.5 MAX activities are designed to prompt learners to directly engage with local environmental circumstances and their related hazards, such as flood management and sustainable agriculture methods. This approach encourages students to engage with themes directly relevant to their surroundings, successfully closing the divide between academic understanding and real-world implementation. The initiative's emphasis on community-based projects fosters locally driven solutions rather than imposing external frameworks (Mignolo, 2018; Sayre et al., 2017). As a result, students are better prepared to contribute meaningfully to the green economy and to a sustainable future (Affolderbach, 2020).

Learning Outcomes: Learning to Do

This research reveals that the 1.5 MAX initiative has had a significant impact on students' engagement with environmental actions. Students have not only become aware of the environmental issues discussed above but have actively engaged in devising solutions. This engagement has led to noticeable advancements in multiple skill areas, which are elaborated upon in the subsequent discussion. These skills are aligned within the CCESD framework; however, it is evident that certain areas within this framework are underrepresented in some schools.

The CCESD framework promotes the cultivation of diverse analytical skills amongst learners, equipping them to explore the multifaceted causes and dimensions of CC and to identify potential actions and consequences for addressing this complex issue (Mochizuki & Bryan, 2015). Interview data (Table 1) indicates that Malawian students enhanced certain key learning capabilities related to the CCESD framework (Mochizuki & Bryan, 2015) following their participation in the 1.5 MAX.

Participation in the initiative enhanced the students' communication skills. Students expressed increased confidence in their ability to communicate with others and learn from environmental practices. One student revealed, "I am confident in presenting and offering advice to people" (S2). Initiatives focused on sustainability can transform students into effective communicators and advocates (Wals, 2011).

Students demonstrated a shift in their ability to undertake individual and collective responsibilities in climate action. Participation in the 1.5 MAX initiative taught them about environmental issues and motivated them to propose their solutions (1.5 MAX, n.d.). An educator (T4) noted, "we are looking at the bigger picture as the government is adopting other solutions [...] but now with 1.5 MAX, they can propose

their own." However, it should not be concluded that this contradicts the findings of Wadson et al. (2023), reporting that most learners in Malawi did not participate in CC mitigation and adaptation practices. This may be because the students engaged in the 1.5 MAX initiative still represent a small proportion of the overall student population in schools, as evidenced by current participation:

> Currently, there are 38 students in the group, and the goal is for them to spread the knowledge to all their schoolmates (T3).

> This year the turnout was very good. I had 20-plus students. Everyone was very willing to attend, and everyone was very willing to continue attending such kinds of activities (T4).

Several challenges have been identified that affect wider student participation and engagement. A major factor frequently mentioned is the lack of available time for teachers, which impacts their ability to support these initiatives. This constraint is directly reflected in teacher feedback:

> One of them is time, it's because a teacher is too busy to help with this (T1).

> We need facilitation for specific tasks. Sometimes, instead of preparing what I am supposed to teach tomorrow, I end up preparing for the 1.5 Max initiative or attending meetings (T2).

Varying levels of student interest in climate action were observed, with many showing eagerness to join as teachers said: "It is surprising to find out some students lack interest in climate action" (T3). This disparity is compounded by skepticism from communities and students about the motives behind such initiatives.

> People often think we are trying to benefit personally. It's hard to convince them that we are doing this voluntarily (T3).

> They expect donations and find it difficult to believe. The main challenge is that my students may not have much interest in researching (T4).

This may stem from a disconnect between the curriculum and students' lived realities, a phenomenon associated with "epistemic disobedience" (Mignolo, 2011). By failing to ground climate education in students' immediate socio-economic and cultural contexts, the system reinforces alienation and skepticism, limiting the transformative potential of such programs (Rudiak-Gould, 2013).

Coping with the Emotional Realities
There is growing literature on climate anxiety, reflecting how profoundly the climate crisis impacts students' lives and emotions (Pihkala, 2022; Soutar & Wand, 2022). Emotional education is overlooked by Malawian educators. The research found that climate issues have exacerbated students' economic hardships in Malawi, rendering them unable to afford tuition and meet basic needs, thereby intensifying their

emotional distress. One teacher stated, "the students' emotions are affected [...] this week, most students were sent away due to school fees" (T4). Another teacher added, "the students are very worried... 'I came here on an empty stomach.' So, I cannot concentrate on my lessons" (T3). Struggling to meet basic needs like food, increases their emotional burden. These invisible wounds are evident in the teacher's interview: "this affects their lives, but it is the emotions that suffer. Sometimes they are not welcoming. Just like last time, a student almost cried" (T2).

Emotional challenges reveal the legacy of colonial systems that have left many Global South countries economically dependent and structurally marginalized (Ulus, 2014). The continued economic vulnerability, seen here in students' struggles with tuition and basic needs, is a symptom of a "colonial matrix of power" (Mignolo, 2023). This matrix perpetuates inequities by prioritizing neoliberal economic models that exacerbate inequalities, leaving students and communities unable to manage the compounded effects of climate change and economic hardships. During visits to schools, the researcher observed how the land that could have been used for cultivating crops to support local food security was allocated for cash crops like tobacco. This prioritization of cash crops over subsistence farming underscores the colonial legacy of economic structures that prioritize global market demands over local needs, entrenching the vulnerabilities of communities (Mwanika et al., 2020). By failing to address these systemic disparities, educational frameworks perpetuate a form of "epistemic violence," which disregards the emotional and psychological realities faced by learners in the Global South (Berry, 2008).

Educators, however, are not cognizant of the need to address the various emotions learners may experience, resulting in ineffective management of feelings of despair, helplessness, and guilt (Phillips, 2009). An educator admitted, "we didn't take care of the specific feelings, we did not" (T2). A basic awareness of students' welfare needs is crucial. A teacher expressed concern that, "this is another thing that as a teacher I should be worried about" (T4). However, considering the strong emotional impact on climate-related hazards, disasters, and future changes can have, it is essential to address the emotional well-being of learners (Lawrance et al., 2022).

Implications for the Future
This section extends analysis of the emerging themes from interviews, including challenges and support needs raised by participants in the final part of the interviews. The narratives from educators and students underscored the urgent need to enhance CCE in Malawi through teaching and learning support.

International Level
From an international perspective, initiatives such as the 1.5 MAX provide crucial support for CCE in Malawi by enriching the curriculum and enhancing student engagement with climate issues. Participation in such global projects helps students understand and address local and international climate challenges. However, ongoing follow-up is essential. Although the 1.5 MAX initiative has established

follow-up activities after each summit, teachers still emphasize the importance of continuous engagement. They advocate that:

> We need to share our progress and achievements at every summit, asking, "What have you done this year? How many activities have you planned?" (T2)

> The other part should be following up. If we have really started working on our projects (T1).

> More attention needs to be paid by the organization to ensure that this knowledge reaches a wider audience (T3).

Educators expressed concerns about the outdated nature of educational content: "The main issue should be to study the reasons for their continuous change. If we stick to one topic, over time it may become irrelevant" (T3). This highlights the need for updated curricula that adapt to evolving knowledge and conditions (Nurdin et al., 2017). This disconnect may arise because national curriculum revisions and updates typically occur over long cycles (Amanchukwu et al., 2015). This disconnect reflects the legacy of coloniality in knowledge systems. The reliance on rigid, globally standardized curricula risks sidelining local and Indigenous knowledge systems that are dynamic and rooted in the lived experiences of Malawian communities (Ezeanya-Esiobu, 2019; Shizha, 2010). Initiatives like 1.5 MAX must prioritize integrating local ways of knowing to ensure contextually relevant and equitable education (Muchenje, 2017; Quigley, 2009).

International support through supplementary reading materials and science books can help to bridge knowledge gaps. Interviews stress this need: "We don't have enough books. We don't have resources like articles about climate change," and "the resource we need is knowledge, especially in books" (T2). This stresses the critical gap in educational materials available to effectively teach and understand climate change. However, it is equally important that these resources are not solely Western-centric but include locally produced materials that reflect the cultural, ecological, and socio-economic realities of Malawi (Shizha, 2010; Quigley, 2009). Follow-up activities for international initiatives like 1.5 MAX could move beyond global dissemination to collaborative knowledge creation. By doing so, the initiative can evolve from a model of knowledge transfer to one of knowledge exchange.

National Level

At the national level, improving teacher training and evaluation mechanisms are key factors for the effective implementation of CCE (Branch et al., 2016; Malawi Government, 2012; Mavuso et al., 2022; Olawumi et al., 2023). According to Mavuso et al. (2022), the implementation of teacher capacitation programs has been shown to improve pedagogical practices by equipping teachers with the necessary content and pedagogical knowledge to integrate CCE into their lessons. Although the policies in

Malawi recognize these aspects as priorities (Malawi Government, 2011), there are deficiencies in teacher engagement and evaluation. At present, most teachers report not having participated in any official training. "No, I have never attended any training provided by the national level or any organization" (T1) is a common response from three teachers. This exposes a deficiency in the availability and delivery of professional development programs for educators. This is consistent with the study conducted among four hundred teachers in Malawi senior secondary schools by Wadson et al. (2023b), which revealed that 93.2% of teachers had never participated in any CCE training.

Many teachers were not adequately prepared to teach CCE courses at the senior secondary school level. In my research, only one teacher participated in an online ESD training provided by an American organization, and this training opportunity was obtained through private channels rather than official educational authorities. This situation reflects a serious deficiency in teacher training. The reliance on externally developed training resources—such as those from foreign organizations—reinforces global knowledge hierarchies that marginalize local expertise and Indigenous knowledge. Teacher training should instead be rooted in Malawi's sociocultural and environmental context, enabling educators to draw from local experiences and knowledge systems while engaging with global frameworks (Brayboy & Maughan, 2009; Kretzer, 2021).

Implementing a standardized teacher evaluation system could help regularly assess and enhance teaching practices. As the teachers expressed,

> We need specialists to work with us, not just to collaborate, but to provide in-depth knowledge. We hope they can visit our schools more frequently (T3).

> We need to share our progress and achievements at every summit, asking each other, 'What have you done this year? How many activities have you planned?' (T2).

This highlights the desire for more consistent and expert support in enhancing educational practices. Establishing a network of CCE educators to share best practices and resources would support this goal (Waldron et al., 2020). Teachers acknowledged, "The knowledge obtained should be shared with the right people, including other teachers and community members." This emphasizes the importance of collaborative learning and community involvement in spreading CCE. Sharing knowledge about CC is crucial for facilitating communication among teachers and strengthening a collective capacity to educate on this topic.

Community Level
Strengthening community participation and cooperation is essential for promoting inclusive CCE methods. Whilst the 1.5 MAX initiative has enhanced students' understanding of environmental issues and their involvement in seeking solutions, community engagement remains limited due to low awareness and financial

constraints. One interviewee (T2) highlighted education's role in community impact, stating, "the more we educate these pupils, the more these pupils will take information to their communities, and the more people will know". This indicates that whilst educational efforts are enriching student knowledge, their transmission to the broader community is insufficient. Funding shortages hinder community involvement. As one teacher (T4) mentioned, "they know how to plant trees, and they have the Indigenous knowledge, but they don't have trees. It's expensive to buy one tree". This indicates that whilst communities possess skills, financial resources for implementation are lacking (Piggott-McKellar et al., 2019).

Addressing the CC crisis increasingly depends on collaborative learning within communities (Ayers & Forsyth, 2009; Davies, 2012). In interviews, teachers expressed the need for greater community awareness, suggesting that "local involvement is a resource in itself, such as the Indigenous knowledge and the natural resources" (T3). This underscores the importance of re-centering local knowledge as an essential epistemic resource. Collaborative learning rooted in local practices enriches climate literacy and challenges the dominance of Western-centric knowledge systems, making education more inclusive and contextually relevant (Anderson, 2012; Mbah & Ezegwu, 2024). Engaging with nature and local communities equips learners with practical climate literacy skills unattainable in conventional classrooms (Orr, 1991). Activities like community gardening teach ecological skills and foster a sense of purpose and connection, as participants benefit from their efforts (Clavin, 2012).

Establishing strong partnerships between schools and communities is crucial in addressing the emotional and socio-economic challenges that students face (Roche & Strobach, 2019). While emotional issues are overlooked in classrooms, community activities like planting and harvesting offer engagement, sensory stimulation, and enjoyable learning experiences. Such interaction encourages 'biophilia[1]', a love for plants and wildlife (Wilson, 1986), fostering sustainable practices. In Malawi, where livelihoods are deeply tied to agriculture and natural resources, this connection to nature can promote sustainable agricultural methods and biodiversity conservation. In regions like Malawi, which face extreme weather events and high food prices, collaborative projects such as self-sustaining gardens equip students with practical tools to combat food insecurity and adapt to challenging conditions effectively.

This approach demonstrates that the health of the environment and the well-being of learners are interconnected (Ensor & Harvey, 2015). By actively participating in the community, learners can exercise their agency within these various constraints, shaping their future and the environment around them.

Conclusion

This paper has explored the impact of the 1.5 MAX initiative on CCE in Malawian secondary schools, addressing key research questions and highlighting implications

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[1] Biophilia refers to "our innate tendency to focus upon life and life-like forms and, in some instances, to affiliate with them emotionally" (Wilson, 2003, p.134).

for future enhancements. The findings demonstrate that the initiative has positively influenced educators and students by fostering a multidisciplinary approach and interactive teaching methods. Educators observed increased student engagement, critical thinking, and problem-solving skills, while students reported a greater understanding of climate issues and expressed a need for more experiential learning opportunities.

Deeper structural and systemic challenges rooted in historical inequalities continue to shape educational frameworks in Malawi. The findings emphasize that the lingering "colonial matrix of power" perpetuates economic and epistemic dependencies, limiting the transformative potential of initiatives like the 1.5 MAX. The prioritization of neoliberal educational models and global market-driven solutions ignores local needs, cultural contexts, and Indigenous Knowledge. This epistemic marginalization constrains educators' capacity to localize CCE and adapt teaching methods to address global and local climate challenges.

To overcome these challenges, this study highlights several critical areas for improvement. Integrating Indigenous knowledge into the curriculum is not only essential for cultural relevance but also represents a vital step toward decolonizing knowledge systems within CCE. Embedding community-based projects that empower students to address local climate issues would foster practical, contextually relevant solutions while challenging colonial educational hierarchies. Second, teacher training programs must prioritize decolonial pedagogies that equip educators with the skills and confidence to navigate complex climate topics while acknowledging the lived realities of their students. Third, strengthening community engagement is vital to creating learning environments that blend local knowledge with global climate action frameworks. Such engagement ensures collaborative problem-solving and shared responsibility for climate resilience, rooted in local agency and self-determination. Finally, establishing feedback mechanisms to regularly evaluate and refine CCE strategies can help align educational objectives with the evolving goals of the ESD framework and the principles of decoloniality.

This research, as the first to apply the combined CCESD and decolonial frameworks to assess the 1.5 MAX initiative in Malawi, provides a novel methodological approach to evaluating climate-focused educational interventions. By integrating academic knowledge, practical applications, emotional education, and decolonial perspectives, the study underscores the necessity of a multidimensional and transformative strategy to prepare students for the challenges of a changing climate. It highlights the value of integrating hands-on projects, participatory teaching methods, and decolonial frameworks to guide the development of equitable and effective educational policies and practices.

Future research should build on these insights by prioritizing the evaluation of policy implementation and its impact on educational outcomes. Exploring innovative approaches to local and global collaboration, leveraging technology, and fostering public-private partnerships can amplify the reach and impact of CCE initiatives. Longitudinal studies are critical for understanding the sustained effects of these

strategies, enabling researchers to track behavioral changes and educational outcomes over time. Future inquiries should examine how decolonial frameworks can be operationalized within educational policy and practice to dismantle systemic inequities and epistemic dependencies.

This study has demonstrated the potential of the 1.5 MAX initiative to advance CCE in Malawi while exposing the structural and epistemic barriers that hinder its broader impact. Addressing these challenges through decolonial and ESD-informed strategies, educators and policymakers can work toward creating an education system that not only equips students with the knowledge and skills to tackle climate challenges but also empowers them to reclaim agency over their futures. This integrated and decolonial approach offers a pathway for Malawi and other Global South contexts to achieve equitable and sustainable climate education outcomes.

Tianshu Chen *recently graduated with a Master of Science (MSc) in Comparative Education and International Development from the University of Edinburgh. Specializing in educational intervention evaluation, her work applies frameworks such as Education for Sustainable Development (ESD) to assess projects like the 1.5 MAX climate change education program in Malawi's secondary schools.*

Debojyoti Das *is an anthropologist and geographer by training with a research focus on the Global South and a strong commitment to sustainability education. With over ten years of experience in teaching, research, and academic scholarship in the United Kingdom higher education sector, Das has worked to embed sustainability principles into both curriculum design and student engagement. Das has designed and led summer schools, field trips, and interdisciplinary workshops that integrate critical pedagogy with sustainability themes, encouraging students to explore global and local challenges through multimedia projects and experiential learning. Das believes in practice-based, 'learning-by-doing' approaches, which have proven effective in deepening students' understanding of complex environmental, sustainability and development issues.*

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