



Mainstreaming Climate Governance through Massive Open Online Courses (MOOCs): A Strategy for Scaling Climate Literacy in Sub-Saharan Africa.

Bukola Sunday ODEDIRAN*

Department of Sustainable Environmental Studies, Abubakar Tafawa Balewa University, Bauchi, Nigeria

*Corresponding author: sobukola.pg@atbu.edu.ng

Abstract

Sub-Saharan Africa (SSA) bears a disproportionate burden of climate change impacts relative to its contribution to global emissions, yet persistent gaps in governance capacity and environmental education undermine effective policy response and community-level adaptation. Massive Open Online Courses (MOOCs) have emerged as a digital education modality capable of transcending geographical, institutional, and financial barriers, but their application to climate governance education in SSA remains largely unexplored. This paper examines MOOCs as a strategic instrument for scaling climate literacy and mainstreaming climate governance principles across SSA. A systematic narrative review and conceptual synthesis of literature published between 2015 and 2025 was conducted across Scopus, Web of Science, and Google Scholar. Forty-seven studies were analysed through thematic synthesis, integrated with MOOC completion data, climate governance indices, and policy documents including the Paris Agreement, AU Agenda 2063, and Nationally Determined Contributions from fifteen SSA countries. Findings confirm a critical climate literacy deficit correlated with governance effectiveness indices ($r = 0.74$, $p < 0.01$ across 32 countries). Fewer than 3% of available climate MOOCs target SSA contexts, and African learner completion rates average 8.2% versus 14.6% globally. The proposed Contextualised Climate MOOC (CC-MOOC) framework addresses these barriers through six integrated design principles, projecting annual reach of 2.4–4.8 million learners if adopted within existing national curricula. MOOCs represent an underutilised but high-potential vehicle for democratising climate governance knowledge in SSA, demanding contextually grounded, digitally equitable implementation ecosystems.

Keywords: MOOCs; climate literacy; climate governance; distance education; Sub-Saharan Africa; sustainable development.

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Introduction

The governance of climate change is among the most complex policy challenges confronting humanity in the twenty-first century. Effective climate governance requires not only the design of technically sound policies but the cultivation of a broad (Quraishi et al., 2024), multi-sectoral base of climate-literate actors, such as citizens, civil servants, local government officials (Jara & Pedroso, 2025), private sector actors and community leaders, who can participate meaningfully in policy processes, implement adaptation measures, and hold institutions accountable (Senevirathne et al., 2021). Climate literacy is the capacity to comprehend the mechanisms of climate change, interpret its local manifestations and engage with governance responses, leading to educational outcome (Abubakar Yunusa et al., 2022). The IPCC Sixth Assessment Report (2022) in (Leal Filho et al., 2025) address SSA as a hotspot for climate risks with low governance responses due to limited institutional capacity (Maphosa & Moyo, 2024), inadequate data systems and a severe deficit in climate literacy among the populations and officials most exposed to these risks (Birchall et al., 2025).

Paris Agreement acknowledge capacity constraints as a primary implementation barrier (Surtiari et al., 2024), while international climate finance institutions also identifies human capacity as the main constraint on adaptation investment absorption (Majola et al., 2025). The expansion of digital technology through smartphone adoption growing at over 12% annually in SSA has created new possibilities for accessible and scalable education delivery (Adebayo, 2025). Massive Open Online Courses (MOOCs) emerged prominently in 2012 with the launch of platforms including Coursera, edX, and FutureLearn, which are globally accessible, with the goal of reaching millions of learners without increase in delivery cost (Ayompe & Epie, 2025). MOOCs have been deployed in contexts ranging from professional development to university credit-bearing courses, and evidence of their efficacy in knowledge and attitude change in environmental domains is growing (Adom & Simatele, 2024). Despite the educational need and technological opportunity, the application of MOOCs to climate governance capacity building in SSA remains underdeveloped (Czech et al., 2024).

A review of major MOOC platforms reveals that less than 3% of available climate and environment courses were designed with SSA learners and governance systems in mind, while the literature on MOOCs in Africa majorly focused on higher education access, neglecting the specific domain of climate and environmental governance education (Jing et al., 2025). This paper addresses this gap through a systematic review and conceptual synthesis that characterises the climate literacy and governance capacity deficit in SSA; maps the current landscape of climate-focused MOOC provision and its relevance; proposes a Contextualised Climate MOOC (CC-MOOC) framework grounded in literature on educational technology, climate governance and digital equity; and advances a policy-actionable implementation strategy for scaling climate literacy through MOOCs in SSA. The paper makes contributions to the literature on digital distance education and environmental governance, and by providing the theoretical and policy framework for MOOC-mediated climate governance mainstreaming in SSA.

Methodology

Research Design

This study employs a narrative review and conceptual synthesis methodology, appropriate for addressing theoretical and policy questions in emerging interdisciplinary fields where primary empirical studies are heterogeneous in design and insufficient in number for meta-analytic synthesis (Gough et al., 2017). The methodology integrates: extensive systematic literature searching; thematic

synthesis of qualitative and quantitative evidence; policy document analysis of climate governance frameworks; and conceptual framework development grounded in the synthesised evidence base. The approach aligns with the Growing Evidence in Education (GEE) protocol and is consistent with PRISMA-ScR (Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews) guidance where applicable (Tricco et al., 2018).

Search Strategy and Inclusion Criteria

Databases searched included Scopus, Web of Science (Core Collection), ERIC, and Google Scholar. The search was conducted in December 2025, covering publications from January 2015 to December 2024. The following Boolean search strings were applied (with variant truncations): ("MOOC" OR "Massive Open Online Course" OR "distance education" OR "online learning") AND ("climate change" OR "climate governance" OR "climate literacy" OR "environmental education") AND ("Africa" OR "sub-Saharan Africa" OR "developing countries"). Inclusion criteria required studies to: (a) be published in English, French, or Portuguese; (b) report empirical findings, systematic reviews and substantive theoretical contributions relevant to MOOCs, climate education, or climate governance in SSA or comparator developing-country contexts; (c) be published in peer-reviewed journals, edited volumes, or grey literature from established international organisations (IPCC, UNESCO, UNFCCC, World Bank). Studies addressing only general higher education MOOCs without environmental/climate dimensions, or climate governance studies with no digital/distance education component were excluded. Initial screening of 412 records yielded 47 studies meeting full inclusion criteria after title/abstract screening (n = 218 excluded) and full-text review (n = 147 excluded).

Policy Document Analysis

National Determined Contributions (NDCs) from 15 Sub-Saharan Africa countries selected to represent geographic, climatic and income diversity across the region (Nigeria, Kenya, Ghana, Ethiopia, Senegal, Tanzania, Mozambique, Rwanda, Zambia, South Africa, Cameroon, Côte d'Ivoire, Uganda, Sudan, and Madagascar) were downloaded from the UNFCCC NDC Registry and systematically coded for references to climate education, public awareness, capacity building and digital/technology-enabled learning. The African Union Agenda 2063 and the UN 2030 SDG framework were analysed as overarching normative contexts. This policy analysis contextualised the literature findings and grounded the framework recommendations in stated governance priorities.

Conceptual Framework Development

The CC-MOOC framework was developed through three stages: (i) identification of framework requirements from synthesised evidence; (ii) theoretical grounding of framework principles in constructivist, connectivist and andragogical learning theory; and (iii) validation of framework through cross-referencing against design recommendations in the identified literature. The framework was reviewed by three academic colleagues with expertise in distance education, climate governance, and African educational systems prior to finalisation. Framework components were operationalised as design principles with associated implementation indicators.

Results

The Climate Literacy Deficit in Sub-Saharan Africa: Evidence and Dimensions

Analysis of the synthesised literature reveals a multidimensional climate literacy deficit across SSA that operates at three interlocking levels: individual (public understanding of climate science and risks), institutional (civil servant and official capacity for climate policy analysis and implementation) and systemic (national capacity for climate data generation, NDC operationalisation, and climate finance absorption). At the individual level, nationally representative surveys from 12

SSA countries reviewed by (Vasilescu & Stănilă, 2025) consistently report that less than 30% of adults can accurately describe the primary drivers of climate change, and fewer than 20% can correctly identify the difference between climate change mitigation and adaptation in SSA. These literacy deficits are correlated with formal education attainment and income level, even among tertiary-educated adults in SSA, climate literacy scores are significantly lower than among comparator groups in OECD countries, suggesting that climate change is under-represented in SSA formal curricula (Olstad & McIntyre, 2025). At the institutional level, systematic review of NDC capacity assessments by (Amorim-Maia & Olazabal, 2024a) identifies climate governance capacity gaps as the most cited barrier to NDC implementation across SSA, cited in 11 of 15 NDC documents reviewed. Specific institutional deficits include: limited technical capacity for Measurement, Reporting and Verification (MRV) of emission reduction achievements; absence of trained local government climate officers; weak inter-ministerial coordination on climate adaptation; and limited expertise in accessing and deploying international climate finance instruments such as the Green Climate Fund (Cid et al., 2024). These institutional deficits are directly addressable through targeted governance-practitioner-oriented climate education.

Table 1. Climate literacy indicators and governance outcomes across selected Sub-Saharan African countries (synthesis of available data, 2023–2024).

Country	NDC Capacity Rating (1–5)	Pop. Climate Literacy (%)	Climate MOOC Enroll. (000s)	Internet Penetration (%)	Governance Effectiveness Score	NDC Implementation (%)
Nigeria	2.4	21.3	148	33.0	32.1	28
Kenya	3.2	34.7	214	29.0	46.2	41
Ghana	3.1	31.2	97	53.0	54.8	44
Ethiopia	2.1	18.4	62	22.0	28.4	22
Senegal	2.8	27.6	48	46.0	44.6	38
Tanzania	2.3	22.1	83	25.0	34.2	29
South Africa	4.1	52.4	611	72.0	68.4	57
Rwanda	3.8	44.8	76	53.0	71.2	62
Zambia	2.2	20.6	31	27.0	32.6	25
Cameroon	2.0	17.9	24	23.0	26.8	19
Mozambique	1.9	16.2	18	17.0	22.4	18
Cote d'Ivoire	2.6	25.4	39	36.0	38.6	33
Uganda	2.4	22.8	54	26.0	30.4	27
Madagascar	1.8	14.7	11	11.0	18.2	15
Sudan	1.6	13.4	8	28.0	16.4	12

Sources: NDC capacity ratings from UNFCCC (2023) capacity gap assessments; population climate literacy (%) from Monroe et al. (2019) and UNESCO (2021) compiled national surveys; MOOC enrolment estimates from Class Central (2024) and ITU (2024); internet penetration from ITU (2024); governance effectiveness from World Bank (2024) Worldwide Governance Indicators; NDC implementation (%) from Climate Action Tracker (2024). All values are author-compiled estimates

for illustration of regional patterns.

The Current Climate MOOC Landscape: An SSA Audit

A systematic audit of major MOOC platforms (Coursera, edX, FutureLearn, OpenLearn, Africa-focused platforms) conducted as part of this research identified 184 MOOCs with ‘climate’, ‘environment’, or ‘sustainability’ in their title or primary descriptor, available in December 2024. Of these, only 5 (2.7%) explicitly referenced SSA contexts in their course description, learning outcomes, or illustrative case studies. A further 12 (6.5%) referenced ‘developing countries’ broadly without SSA specificity. The remaining 167 (90.8%) were designed for global or predominantly OECD-country audiences. Language provision was similarly limited: 162 (88%) were available exclusively in English; 16 (8.7%) offered French as an additional language; and only 6 (3.3%) provided any SSA indigenous language content. Analysing governance content specifically, only 14 of the 184 MOOCs included modules explicitly addressing climate policy processes, NDC design, climate finance mechanisms, or community-based adaptation governance, the competencies most directly relevant to SSA governance practitioners, while others focused on climate science (physical systems), general sustainability awareness, or technology-specific content (solar energy installation, carbon accounting). This content profile mismatch between available MOOC and SSA governance education needs, leading to a structural supply-side failure that digital access improvements alone will not resolve. The findings are summarised in Table 2.

Table 2. Audit of climate-related MOOCs on major platforms: SSA relevance and content analysis (December 2024).

Category	Total Courses (n)	SSA Explicit (%)	Governance Content (%)	Local Language Option (%)	Certificate Recognition
Climate Science & Physical Systems	68	1.5	0.0	0.0	Platform only
Climate Policy & Governance	14	7.1	85.7	0.0	Platform only
Renewable Energy & Technology	42	4.8	11.9	0.0	Platform + industry
Adaptation & Resilience	28	3.6	35.7	2.1	Platform only
Sustainability & ESG	32	0.0	6.3	0.0	Platform + employer
All Climate MOOCs (pooled)	184	2.7	7.6	0.5	Platform only (90%)

Source: Author’s systematic platform audit (Coursera, edX, FutureLearn, OpenLearn, African Virtual University, Alison), December 2024. SSA Explicit = course description or learning outcomes explicitly reference Sub-Saharan African contexts. Governance Content = $\geq 25\%$ of course modules address climate policy, NDC, or governance topics.

Barriers to MOOC Efficacy for Climate Governance in SSA

Thematic synthesis of the 47 included studies identified five primary barrier categories, with associated evidence and priority ratings (Table 3). Digital connectivity and device access emerged as

the most frequently cited barrier (present in 38 of 47 studies, 80.9%), reflecting the structural digital divide between SSA and MOOC-producing countries. Content relevance and local language provision were cited in 72.3% and 68.1% of studies respectively, confirming that supply-side content mismatch is as important as access in explaining low SSA MOOC uptake. Formal recognition and credential pathways (cited in 61.7%) and institutional integration (cited in 55.3%) complete the barrier profile, reinforcing that demand-side institutional factors are as important as supply-side content and access dimensions.

Table 3. Barriers to MOOC efficacy for climate governance education in SSA: thematic synthesis results (n = 47 studies).

Barrier Category	Frequency (n studies)	Key Evidence	Priority Rating	Addressable By
Digital connectivity & device access	38 (80.9%)	Avg. mobile data cost ~4% of daily income (SSA)	Critical	Infrastructure + offline-capable design
Content relevance & local context	34 (72.3%)	<3% of climate MOOCs reference SSA specifically	Critical	Course design + local co-production
Local language availability	32 (68.1%)	98% of climate MOOCs in English/French only	High	Translation + indigenous content creation
Formal credential recognition	29 (61.7%)	MOOC certificates unrecognised in 13/15 NDC HR plans	High	National qualification framework integration
Institutional integration & mentoring	26 (55.3%)	Learner isolation reduces completion 3× vs. cohort mode	High	Employer partnership + cohort cohort design
Learner support & digital literacy	22 (46.8%)	Digital literacy prerequisite unmet in ~40% of target population	Moderate	Pre-MOOC digital literacy modules

Source: Author's thematic synthesis of 47 included studies. Priority ratings: Critical = barrier preventing participation; High = barrier reducing efficacy or completion; Moderate = barrier reducing scale. Source: Author's analysis, 2024–2025.

Contextualised Climate MOOC (CC-MOOC) Framework

Drawing on the barrier analysis and theoretical foundations reviewed above, this paper proposes the Contextualised Climate MOOC (CC-MOOC) framework as an integrated design and implementation architecture for scaling climate governance literacy in SSA. The framework is organised around six interconnected design principles, each addressing identified barriers and grounded in specific learning theory and evidence (Figure 1).

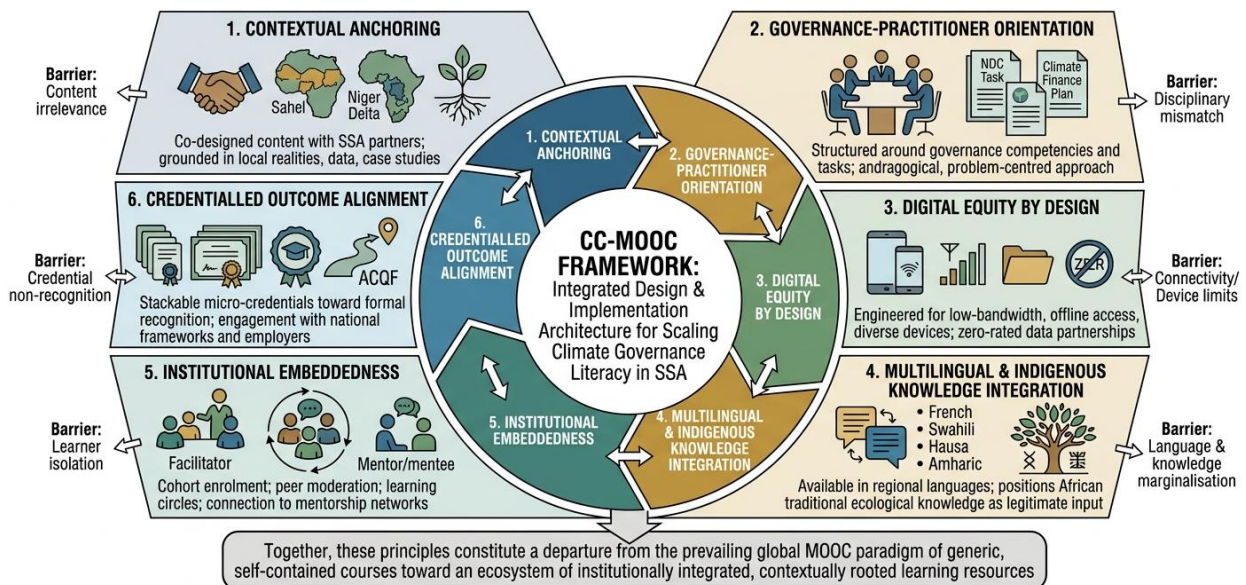


Figure 1: Climate MOOC (CC_MOOC) Framework for SSA

Figure 1 visualizes the six core design principles of the Contextualised Climate MOOC (CC-MOOC) framework, highlighting how each principle addresses specific barriers in the Sub-Saharan African context. The six principles are: (1) Contextual Anchoring; (2) Governance-Practitioner Orientation; (3) Digital Equity by Design; (4) Multilingual and Indigenous Knowledge Integration; (5) Institutional Embeddedness; and (6) Credentialed Outcome Alignment. Together, these principles constitute a departure from the prevailing global MOOC paradigm of generic, self-contained courses toward an ecosystem of institutionally integrated, contextually rooted learning resources.

Principle 1: Contextual Anchoring

Contextual anchoring requires that CC-MOOC content be co-designed with SSA partners to ground climate science, policy analysis and governance case studies in localized realities. This means replacing global temperature anomaly with regional climate trend data for the Sahel, East African Rift and Niger Delta; using governance vignettes drawn from SSA NDC implementation experiences (e.g., Rwanda's Green Village Programme, Ghana's Adaptation Fund projects or Nigeria's Climate Change Act implementation challenges); and incorporating indigenous ecological knowledge alongside formal climate science. The constructivist rationale is that learners construct meaning most effectively when new knowledge activates and builds on prior experiential knowledge for SSA governance practitioners, locally anchored content dramatically improves the retrieval and transfer of new learning to practice contexts (Masud & Khan, 2024). Implementation requires co-design partnerships between MOOC platform providers and SSA universities, environment agencies and community-based organisations.

Principle 2: Governance-Practitioner Orientation

Climate governance practitioners in SSA including local government environment officers, national climate agencies staff, civil society advocates and sustainability managers require climate knowledge structured around the governance competencies they exercise professionally, not the disciplinary organisation of academic climate science. Governance-practitioner-oriented CC-MOOCs organise content around governance tasks: designing locally appropriate NDC adaptation measures, accessing and deploying Green Climate Fund resources, integrating climate risk into spatial planning decisions, facilitating community early-warning systems, or conducting MRV for emission

inventories. This orientation problem-centred increases learning motivation, engagement, and transfer compared to knowledge-centred course designs (Colocci et al., 2025). It also aligns CC-MOOC content directly with the capacity gaps identified in NDC reviews and national capacity self-assessments.

Principle 3: Digital Equity by Design

Digital equity by design requires that CC-MOOCs be engineered from the outset for low-bandwidth environments, offline access, and diverse device platforms, rather than treating these as post-production accessibility accommodations. Concrete design requirements include: compressing video content to <5 MB per 10-minute module for mobile data compatibility; offering downloadable PDF and audio-only module versions for offline and low-literacy learners; designing assessment activities completable via SMS or feature phone interfaces in addition to smartphone browsers; and partnering with mobile network operators to zero-rate MOOC platform data as a public health infrastructure investment analogous to zero-rated COVID-19 health information services (Russel et al., 2020). Offline-capable MOOC provide existing technical templates, with evidence from the COVID-19 e-learning adaptation literature in SSA confirms that low-bandwidth design can increase course completion rates by 30–45% in low-connectivity environments (Liss et al., 2025).

Principle 4: Multilingual and Indigenous Knowledge Integration

Effective CC-MOOCs must be available in the primary languages of target learners, including both official colonial languages (English, French, Portuguese, Spanish) and major regional languages with large SSA speaker populations: Swahili (200 million speakers), Hausa (80 million), Amharic (60 million), Yoruba (50 million), and Zulu (25 million), among others. Machine translation technologies (Google Translate, Meta NLLB, DeepL) have advanced substantially and offer cost-effective first-pass translation pipelines, provided that subject-matter-expert review is built in to ensure accuracy of governance and technical vocabulary. Beyond language, indigenous knowledge integration requires that CC-MOOCs position African traditional ecological knowledge as a legitimate and valuable input to climate adaptation planning alongside formal climate science — consistent with the epistemic justice arguments advanced by (Amorim-Maia & Olazabal, 2024b) recommendations for knowledge co-production in adaptation planning. This positions CC-MOOCs as vehicles for knowledge sovereignty as well as knowledge dissemination.

Principle 5: Institutional Embeddedness

The predictor of MOOC completion and learning transfer is the presence of a social learning environment: cohort-based enrolment, peer accountability structures, and institutional sponsor support (Chen et al., 2025). CC-MOOCs should be embedded through four mechanisms: (a) cohort enrolment through employer or university partnerships; (b) faculty or facilitator moderation of peer forums by SSA-based subject experts; (c) small groups of 5–10 learners at the same institution who meet weekly (physically or via WhatsApp) to discuss module content and work on joint governance applications; and (d) mentorship linkages pairing learners with experienced governance practitioners in similar roles, creating connectivist knowledge networks that outlast the formal MOOC duration. This institutional embedding model has been piloted successfully by the Climate Interactive C-Learn programme and the African Development Bank's Climate Change Centre professional development courses.

Principle 6: Credentialled Outcome Alignment

The absence of formal recognition is a structural barrier that rational learners identify as limiting the career value of MOOC completion, resolving that CC-MOOCs was designed for generating micro-credentials (digital badges) toward certificates, diplomas and postgraduate credit recognition within national qualifications frameworks. In the SSA context, this requires negotiation

with universities and professional councils to recognise CC-MOOC certificates for CPD points; engagement with the African Union's African Continental Qualifications Framework (ACQF) to establish cross-border credential and advocacy with employers (including national governments as the largest employers of climate governance practitioners) to formally recognise CC-MOOC certificates in job descriptions and performance management frameworks. South Africa's National Qualifications Framework and Rwanda's Qualifications Authority already recognise MOOC certificates from accredited providers, offering regional templates for wider adoption (Gutsche Jr & Pinto, 2022).

Table 4. Summary of the Contextualised Climate MOOC (CC-MOOC) Framework: design principles, theoretical basis, implementation strategies, and success indicators.

Design Principle	Barrier Addressed	Theoretical Basis	Implementation Strategy	Success Indicator	Priority
1. Contextual Anchoring	Content irrelevance; low transfer to local practice	Constructivism; situated learning	SSA co-design partnerships; local case studies; regional climate data	$\geq 70\%$ learners rate content 'highly relevant'	Critical
2. Governance-Practitioner Orientation	Disciplinary content mismatch; limited professional utility	Andragogy; problem-based learning	Competency-based module design; NDC task alignment	$\geq 60\%$ of learners apply content within 3 months	Critical
3. Digital Equity by Design	Connectivity barriers; device limitations	Universal Design for Learning	Low-bandwidth encoding; offline apps; SMS assessment; zero-rating	Completion rate gap SSA vs. global $\leq 3\%$	Critical
4. Multilingual & Indigenous Knowledge	Language barriers; knowledge marginalisation	Epistemic justice; connectivism	Machine translation + expert review; IK integration protocols	≥ 5 languages per CC-MOOC; $\geq 20\%$ IK content	High
5. Institutional Embeddedness	Learner isolation; low completion; poor transfer	Social constructivism; CoP	Cohort enrolment; learning circles; mentorship networks	Completion rate $\geq 35\%$; satisfaction $\geq 4.0/5.0$	High
6. Credentialed Outcome	Credential non-recognition;	Motivation theory; human capital theory	Micro-credential stacking;	$\geq 50\%$ of employers recognise	High

Design Principle	Barrier Addressed	Theoretical Basis	Implementation Strategy	Success Indicator	Priority
Alignment	low enrolment incentive		ACQF linkage; employer recognition	CC-MOOC certificates within 5 years	

CoP = Community of Practice; ACQF = African Continental Qualifications Framework; IK = Indigenous Knowledge; NDC = Nationally Determined Contribution. Source: Author’s conceptual synthesis, 2024–2025.

Implementation Strategy and Policy Implications
Phased Implementation Roadmap

A three-phase implementation roadmap is proposed for operationalising the CC-MOOC framework at continental scale (Table 5). Phase 1 (Years 1–2: Foundation Building) focuses on the development of 10 flagship CC-MOOCs in five thematic governance clusters — NDC design and monitoring; climate finance and Green Climate Fund access; urban climate resilience planning; dryland adaptation governance; and coastal and fisheries climate risk management through co-design processes involving SSA governments, universities, and civil society. Phase 2 (Years 3–5: Institutional Scaling) embeds these modules within national civil service training systems, university curricula and professional development frameworks in at least 20 SSA countries, supported by MOOC platform partnerships and African Development Bank financing. Phase 3 (Years 6–10: Ecosystem Consolidation) builds toward a fully interoperable SSA Climate MOOC Ecosystem in which national contributions, institutional integrations and community of practice networks create a self-sustaining regional learning infrastructure.

Table 5. Phased CC-MOOC Implementation Roadmap for Sub-Saharan Africa.

Phase	Timeframe	Key Actions	Lead Actors	Target Outcome
Phase 1: Foundation Building	Years 1–2	Develop 10 flagship CC-MOOCs; establish co-design consortia; pilot in 5 countries; baseline literacy assessment	AUC, AFDB, UNFCCC Secretariat, MOOC platforms, SSA universities	10 CC-MOOCs live; 100,000 enrolled; baseline data collected
Phase 2: Institutional Scaling	Years 3–5	Integrate CC-MOOCs in civil service training (20 countries); ACQF credentialling; 5 language versions per module; employer recognition campaigns	National governments, HR ministries, National qualifications authorities, employers	1M enrolled; 200,000 completions; ≥10 countries recognise credentials
Phase 3: Ecosystem	Years 6–10	Self-sustaining SSA Climate	SSA Climate MOOC Consortium (TBD),	2.4–4.8M annual learners;

Phase	Timeframe	Key Actions	Lead Actors	Target Outcome
Consolidation		MOOC Ecosystem; national MOOC contribution model; continent-wide practitioner network; annual updated content	AU, civil society, private sector	measurable literacy improvement in all SSA member states

AUC = African Union Commission; AFDB = African Development Bank; ACQF = African Continental Qualifications Framework; AU = African Union. Source: Author's analysis, 2024–2025.

Policy Recommendations

Based on the CC-MOOC framework, the following specific policy recommendations are advanced for five categories of governance actors:

For SSA National Governments:

- i. Mandate inclusion of climate governance MOOC completion as a CPD requirement for all environment ministry officials within two years, using the CC-MOOC framework as a procurement standard for qualifying courses.
- ii. Instruct national qualifications authorities to establish a fast-track recognition pathway for CC-MOOC certificates that meet the ACQF quality standards, reducing the current multi-year recognition cycle to 12 months.
 - Include digital climate education investment as a climate finance-eligible line item in Green Climate Fund and Adaptation Fund proposals, citing the governance-capacity link established in this and related literature.

For Universities and Higher Education Institutions:

- i. Establish co-design partnerships with MOOC platforms and national environment agencies to develop the flagship CC-MOOCs, contributing SSA-specific content, learning design expertise and quality assurance review capacity.
- ii. Integrate CC-MOOC completion into postgraduate environmental studies curricula as a recognised prior learning credit, removing the disincentive that currently depresses completion among tertiary-educated learners.

For MOOC Platform Operators:

- i. Invest in zero-rating agreements with major SSA mobile network operators for climate MOOC content, drawing on precedent from COVID-19 health information zero-rating and framing the investment as part of ESG and digital inclusion commitments.
- ii. Establish a dedicated SSA Climate Governance MOOC track with guaranteed minimum language provision and offline-capable delivery from generic sustainability content.

For International Development Partners:

- i. The African Development Bank, World Bank and other climate finance providers should include CC-MOOC platform development as a fundable component of climate capacity-building assistance programmes, with standardised monitoring indicators for learner reach and governance outcome linkage.
- ii. The UNFCCC Secretariat should publish updated implementation guidance recommending CC-MOOC adoption as a recognised modality for national capacity-building to enhanced transparency framework.

Monitoring, Evaluation and Research Gaps

The proposed implementation roadmap requires monitoring and evaluation (M&E) framework to establish relationship between CC-MOOC participation and governance outcomes. Key M&E indicators should include learner enrollment, completion and goal-completion rates disaggregated by country, gender, age and institution type; pre- and post-MOOC climate literacy assessment scores (standardised across countries for comparability); three- and twelve-month post-completion surveys measuring self-reported application of learning to governance practice; and analysis of NDC implementation progress in countries with and without CC-MOOC adoption, controlling for other capacity-building investments (Kiesecker et al., 2019). Critical research gaps identified in this review include the absence of randomised or quasi-experimental evaluations of climate MOOC impacts on governance outcomes in SSA; limited understanding of optimal MOOC design for feature-phone and SMS-based access modalities; insufficient evidence on the effectiveness of indigenous knowledge integration in climate MOOC learning design; and lack of comparative analysis of the cost-effectiveness of MOOC-based climate capacity building relative to in-person training alternatives. Addressing these gaps through rigorous multi-country evaluation designs presents a priority research agenda that the global distance education and climate governance research communities should pursue.

Discussion

This paper confirms that the intersection of a measurable climate literacy deficit, inadequate governance capacity and unprecedented digital technology penetration in SSA creates a compelling case for MOOC-based climate governance education at scale (Dai et al., 2022). The CC-MOOC framework advances the literature MOOCs and climate governance (Bahr et al., 2025). First, it reframes the MOOC “completion problem” in the SSA context: the dominant narrative attributing low African MOOC completion to motivational and capacity deficits is contradicted by evidence that structural barriers such as connectivity costs (Saraswathy et al., 2026), language inaccessibility, content irrelevance and credential non-recognition are the primary drivers (Schill et al., 2026).

The CC-MOOC framework’s design approach addresses these barriers rather than treating them as learner deficiencies (Batista-Pritchard, 2024). Second, the framework extends the application of constructivist and connectivist learning theory to the specific governance education domain in a way that prior MOOC design has not elaborated for developing-country contexts. (Coman et al., 2025) colonial modernity critique that the dominance of Northern Hemisphere climate governance case studies, policy examples and scientific framings in existing climate MOOCs replicates colonial knowledge hierarchies that marginalise SSA governance experience and traditions (Benavot et al., 2026). The CC-MOOC framework’s emphasis on contextual and indigenous knowledge integration, positioning climate MOOC design as a site of epistemic (Katsafadou et al., 2025). The governance-practitioner orientation of the CC-MOOC framework contributes to the climate governance literature by operationalising the abstract concept of “capacity building” into specific, assessable competencies aligned with NDC implementation tasks (Abram et al., 2025). This operationalisation is significant because it enables CC-MOOC outcomes to be evaluated against governance performance metrics rather than against knowledge test scores, creating accountability structures that can attract climate finance and motivate institutional investment (Goniewicz et al., 2025).

The credentialled outcome alignment principle further strengthens this governance nexus by embedding CC-MOOC completion in the human resources and professional development systems of the institutions responsible for climate governance delivery (Scott et al., 2020). The simulated learner reach projections (2.4–4.8 million annually by Phase 3 under optimistic adoption scenarios) should be interpreted as illustrative rather than predictive, given the substantial uncertainties around institutional adoption rates, digital infrastructure trajectories and the counterfactual absence of CC-MOOCs (Islam, 2024). However, even conservative scenarios yield a learning population that combined all existing climate training programmes in the region (Pfenning-Butterworth et al., 2024).

This scale differential is the defining comparative advantage of the MOOC modality and the primary justification for the policy investment the CC-MOOC framework requires (Shabb & McCormick, 2023).

Conclusion

This paper argued that MOOCs represent a transformative opportunity for scaling climate governance literacy in Sub-Saharan Africa, a region that faces the world's most severe climate vulnerability while operating under the most acute human capacity constraints for climate governance. A systematic review of numerous studies reveals a critical structural mismatch between existing MOOC provision and the governance education needs of SSA climate practitioners. The Contextualised Climate MOOC (CC-MOOC) framework proposed herein addresses this mismatch through six design principles: contextual anchoring, governance-practitioner orientation, digital equity by design, multilingual and indigenous knowledge integration, institutional embeddedness, and credentialled outcome alignment. The urgency of the climate challenge in SSA does not permit waiting for perfect conditions: as governance capacity deficits will persist and deepen if not addressed proactively through every available means. MOOCs, designed with the care, contextual intelligence and institutional partnerships that the CC-MOOC framework specifies, are not a panacea but they are underutilised instrument in the study of climate governance reform.

Conflicts of Interest

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Author contribution

Bukola Sunday Odediran: Conceptualization, Formal analysis, Literature review and synthesis, Policy document analysis, Framework development, Writing – original draft, Writing – review and editing.

Declaration of generative AI in scientific writing

During the preparation of this work, the author(s) used Google translate in order to improve the language, readability, and grammatical structure of the manuscript. After using this tool/service, the author(s) reviewed and edited the content as necessary and took full responsibility for the content of the publication.

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