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An overview of the impacts of gender-responsive climate education in Africa

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Abstract

Climate change is reshaping Africa in profound and multifaceted ways, from recurrent droughts in the Horn of Africa to rising sea levels threatening coastal communities in West Africa. These disruptions extend beyond ecological degradation, intensifying social inequalities and disproportionately burdening girls. Malala Fund's report on A Greener, Fairer Future: Why Leaders Need to Invest in Climate and Girls' Education, estimated that in 2021 climate-related events prevented at least four million girls in low- and lower-middle-income countries from completing their education. If the trend continues, climate change would be a contributing factor in preventing at least 12.5 million girls from completing their education each year across 30 climate-vulnerable countries. Twenty-two of these countries were in Africa. Within this context, education emerges not merely as a vehicle for awareness but as a strategic instrument for cultivating resilience, leadership and inclusive climate solutions. This paper interrogates the nexus between gender-responsive climate education and nurtured leadership in Africa, situating its analysis within continental policy frameworks and grassroots initiatives. The study employs a qualitative research design that integrates document analysis and case studies. Document analysis focused on three key frameworks: the African Union Strategy on Gender Equality and Women's Empowerment (AU-GEWE Strategy 2018–2028), the Continental Education Strategy for Africa (CESA 16–25) and Agenda 2063. Findings reveal that while climate education is increasingly embedded within African educational systems, many programs remain narrowly scientific, limiting their contextual relevance. ESD frameworks, integrated in primary and secondary schools located in Kenya and Ghana mostly, encourage

learners to connect global sustainability imperatives with community-based action, fostering civic engagement and community participation in sustainable development geared towards addressing climate change. Climate education must also be gender-responsive, given the disproportionate vulnerabilities faced by women and girls including heightened risks of school dropout, displacement and resource scarcity during environmental crises. Despite these challenges, women across Africa are spearheading grassroots adaptation efforts, managing natural resources and advocating for environmental justice. Gender-responsive education amplifies these contributions by cultivating inclusive learning environments and leadership pathways. Case studies illustrate the transformative potential of targeted interventions. The Future Female Leaders in Energy – Africa program, launched in 2023, has trained over 300 young women from more than 10 African countries in clean energy and climate advocacy, with alumni founding startups and influencing national policy. Green Girls Platform (GGP) is a non-profit young women-led organization that works with girls and young women aged 8-35 to address the unique challenges that they face due to climate change in Malawi. The Mastercard Foundation's Climate Impact Challenge Fund has supported SMEs majority of which were filled by women and youth. Global initiatives such as the IAEA Marie Skłodowska-Curie Fellowship Programme have further expanded opportunities, sponsoring African women to pursue postgraduate studies in nuclear science and clean energy, thereby strengthening the pipeline of female climate leaders. This paper calls upon educators, policymakers and development partners to prioritize investment in gender-responsive climate education, recognizing that sustainable solutions will be shaped by diverse voices, particularly those that have been historically marginalized.

Key terms: Climate Education; Gender Equity; Climate Leadership; Education for Sustainable Development; Agenda 2063

1.0 INTRODUCTION

Africa's climate crisis is both acute and uneven. From recurrent droughts across the Horn of Africa to coastal flooding in West Africa, climate impacts intensify social and economic vulnerabilities particularly for women and girls who disproportionately shoulder care responsibilities, water and fuel collection, and household survival during environmental crises. Malala Fund's report on A Greener, Fairer Future: Why Leaders Need to Invest in Climate and Girls' Education, estimated that in 2021 climate-related events prevented at least four million girls in low- and lower-middle-income countries from completing their education. If the trend continues, climate change could contribute factor in preventing at least 12.5 million girls from completing their education annually across 30 climate-vulnerable countries. Twenty-two of these countries are in Africa. (Malala Fund, 2026). In this context, education is more than a conduit for awareness, it is a strategic lever for cultivating climate leadership, resilience and inclusive solutions that reflect local realities and redistribute voice and power in decision-making (African Union, 2015; UNESCO, 2017).

This paper examines how gender-responsive climate education can impact the vulnerable populations,

especially women and girls across African contexts. It situates analysis within continental policy frameworks such as the African Union Strategy on Gender Equality and Women's Empowerment (AU-GEWE Strategy2018–2028),the Continental Education Strategy for Africa(CESA16–25),and Agenda 2063; and explores practice-based insights from targeted programs: Education for Sustainable Development(ESD)initiatives, the Future Female Leaders in Energy–Africa programme, Green Girls Platform (Malawi), the Mastercard Foundation's Climate Impact Fund and the IAEA Marie Skłodowska-Curie Fellowship Programme. By combining document analysis with case studies, the paper reconciles policy aspirations with grassroots realities and articulates how gender-responsive education can strengthen a pipeline of women and youth leaders in climate action.

2.0 LITERATURE REVIEW

2.1 Gender, climate vulnerability and leadership

Climate impacts in Africa intersect with gender norms to deepen inequalities. Women and girls often experience heightened risks of school dropout, early marriage, displacement and resource scarcity during crises, while simultaneously leading house hold adaptation, local natural resource management and community resilience efforts. Meaningful participation requires enabling policy frameworks, targeted capacity-building, and inclusive learning environments that address barriers such as safety, mobility, time poverty and digital exclusion (Cornwall, 2016; Agyeman & Evans, 2003).

2.2 Education for Sustainable Development and contextual relevance

Education for Sustainable Development (ESD) advances competencies such as systems thinking, anticipatory skills, collaboration and civic engagement while linking global sustainability discourse to community action (UNESCO, 2017). Research in Kenya and Ghana shows that when ESD is contextualized integrating local ecosystems, livelihoods, and indigenous knowledge, it fosters innovation, student contribution and sustained participation (Anane, 2020; Wambugu & Amini, 2019). However, critiques of climate education in the region note that curricula can be narrowly scientific, sidelining social justice, gender dynamics and policy literacy, thereby limiting leadership pathways (Leal Filho et al., 2018).

2.3 Continental policy frameworks: AU-GEWE, CESA, and Agenda 2063

Agenda 2063 envisions inclusive growth, sustainable development and gender equality as core continental goals (African Union, 2015). The African Union Strategy on Gender Equality and Women's Empowerment (AU-GEWE) Strategy operationalizes these aims through pillars on education, economic empowerment and leadership, emphasizing measurable outcomes and mainstreaming across sectors (African Union, 2018). CESA 16–25 complements this strategy with system-level reforms, ranging from curriculum transformation and teacher professional development to TVET alignment, enabling responsive and competency-driven education (African Union, 2016). Together, these frameworks provide enabling conditions for gender-responsive climate education, though implementation gaps persist due to funding constraints, governance bottlenecks, and variable national capacities (UNECA, 2020).

2.4 Targeted leadership pipelines in energy and climate

Emerging initiatives such as women-led fellowships, clean energy leadership programs and STEM scholarships signal a shift from awareness to leadership development. Programs that combine mentorship, experiential learning, policy engagement and access to finance show stronger outcomes, including entrepreneurship, policy influence, and participation in national and regional climate dialogues (IAEA, 2020; Mastercard Foundation, 2023). Yet sustained impact depends on ecosystem linkages:

integration with public policy, private sector demand and community-level implementation.

3.0 METHODOLOGY

This study adopts a qualitative research design that integrates document analysis with case studies to interrogate the nexus between gender-responsive climate education and inclusive leadership in Africa. The choice of this design reflects the need to capture both the normative aspirations embedded in continental policy frameworks and the lived realities of grassroots initiatives.

Document analysis focused on three key frameworks: the African Union Strategy on Gender Equality and Women's Empowerment (AU-GEWE Strategy 2018–2028), the Continental Education Strategy for Africa (CESA 16–25), and Agenda 2063. These frameworks were selected because they represent the most authoritative continental visions for gender equity, educational transformation, and sustainable development. Their provisions on climate resilience and gender equality provide a benchmark against which grassroots practices can be assessed.

Case studies were chosen to illustrate diverse approaches to gender-responsive climate education. The Education for Sustainable Development (ESD) initiatives in Kenya and Ghana exemplify how national education systems embed sustainability into curricula, linking global imperatives with community-based action. The Future Female Leaders in Energy – Africa program was selected for its regional scope in Africa and measurable outcomes, having trained over 300 young women from more than 10 African countries, clean energy and climate advocacy since 2023. The Green Girls Platform in Malawi was included as grassroots, youth-led initiative that directly addresses the vulnerabilities of girls aged 8–35 in climate-affected communities. The Mastercard Foundation's Climate Impact Fund was chosen to highlight how financial mechanisms can empower women-led SMEs in climate adaptation, while the IAEA Marie Skłodowska-Curie Fellowship Programme demonstrates how global initiatives expand opportunities for African women in nuclear science and clean energy. Together, these cases provide a spectrum of interventions that enrich the analysis.

Data was collected from secondary sources, including public policy documents, program reports, organizational websites and descriptive statistics referenced in program materials. While this approach ensured breadth and validity, limitations arose from the variation in data availability and comparability across programs. For instance, some initiatives reported detailed gender-disaggregated outcomes, while others provided only aggregate figures. Moreover, the outcomes are highly context-dependent, meaning findings may not generalize across all African subregions. This limitation underscores the importance of situating results within specific national and community contexts rather than assuming uniform applicability.

Ultimately, this methodology ensures that the research captures both the aspirational and practical dimensions of climate education. It highlights how gender-responsive approaches can reinforce Africa's Agenda 2063 goals of inclusive growth, sustainable development, and youth empowerment, while acknowledging the challenges posed by uneven data and context-specific outcomes.

4.0FINDINGS

4.1 Education for Sustainable Development (ESD)

ESDinKenyaandGhanaillustratesblendedlearningfromclassroominstruction,project-based tasks to community engagements that are grounded in local environmental issues (UNESCO, 2017). Students demonstrate civic participation through school-led conservation, water management stewardship and clean energy micro-projects. Teachers have continuously reported increased problem-solving and

collaboration. ESD is intentionally gender-sensitive, offering safe spaces, targeted mentorship and flexible scheduling hence girls' participation increases, especially in STEM-aligned activities. ESD advances CESA's competency agenda and Agenda 2063's human capital vision but requires sustained teacher training and resource provision.

4.2 Future Female Leaders in Energy–Africa (FFLE-A)

The programme was launched in 2023 and has trained over 300 young women across 15 African countries in clean energy, climate advocacy and leadership. Alumni have founded startups, convened policy dialogues, and contributed to national energy strategies. The curriculum features leadership modules, energy systems fundamentals, financial and risk management labs and mentorship with emphasis on practical capstone projects and network-building. The programme generally combines technical literacy with advocacy and entrepreneurship, enabling graduates to bridge community needs with policy forums and markets.

4.3 Green Girls Platform (Malawi)

A young women-led nonprofit engaging girls and women aged 8–35 that addresses climate challenges through education, advocacy, and community projects. The organization launched the *E-STEM for Climate Action Initiative* that integrates STEM disciplines into environmental education to equip young people with the knowledge and skills to understand climate change and design locally relevant solutions. Piloted in 2022 in rural Lilongwe, Malawi, with support from the North American Association of Environmental Education (NAAEE), the program engaged 450 learners aged 11–20 across three schools and one community. Over twelve months, participants implemented four climate action projects, demonstrating the potential of E-STEM approaches to foster youth-led adaptation. Building on this success, the project expanded in 2024 with UNESCO's support to Salima District, reaching another 450 learners through three schools and one community over nine months, thereby reinforcing the replicability of the model in different contexts.

In 2025, the initiative scaled further with funding from Irish Aid through Trocaire Malawi, extending to three additional schools in rural Lilongwe. This phase broadened the age range to include learners aged 8–20 and engaged 300 participants over nine months. Across these phases, the project illustrated how embedding STEM within environmental education empowers young people as agents of climate resilience. The iterative expansion, supported by diverse international partners, underscores both the adaptability of the model and its potential for wider application across African contexts. Some key outcomes in the leadership context included enhanced public speaking, community organizing and policy engagement where participants initiated local adaptation projects such as improved cookstoves and reforestation. However, some constraints were noted that included resource scarcity, the digital divide and safety concerns. Partnerships with schools and local authorities help mitigate these barriers.

4.4 Mastercard Foundation Climate Impact Fund

ThisprogrammesupportsAfrica-basedSMEsandsocialenterpriseswithasignificantshareled by women and youth in developing climate-smart agriculture, clean energy access and green jobs (Mastercard Foundation, 2023). The financing mechanisms include grant and blended finance;technicalassistanceandmarketlinkagesintegratedwithyouthemploymentstrategies. The objective of the programme is to provide funding to at least 20 gender-diverse African Investment Vehicle (IV) teams, enabling them to support a minimum of 200 small and medium-sized enterprises (SMEs) in key sectors. By doing so, the initiative aims to generate access to 250,000 or more direct and indirect employment opportunities. The Fund adopts a holistic ecosystem approach to impact investing in Africa,

focusing on strengthening and expanding investment teams that are registered and operating on the continent. This has resulted in women, and youth founders gain capital, mentoring, and networks; enterprises scale community solutions, enabling local leadership to influence policy uptake.

4.5 IAEA Marie Skłodowska-Curie Fellowship Programme

The IAEA Marie Sklodowska-Curie Fellowship offers scholarships for women to pursue postgraduate studies in nuclear science and related clean energy fields (IAEA, 2024). This has increased representation of African women in high-impact STEM disciplines with fellows contributing to research, regulatory bodies, and energy planning. This global fellowship aligns with AU-GEWE's leadership and education pillars and CESA's push for STEM enhancing technical legitimacy in climate decision-making spaces.

5.0 DISCUSSIONS

Gender-responsive climate education plays a transformative role in catalyzing inclusive leadership. By moving learners from mere access to genuine agency, it creates pathways for girls and women to not only participate but also to lead as they are the most affected by climate change crisis. Safe learning environments, mentorship opportunities, flexible delivery models and attention to prevailing social norms ensure that learners are empowered to initiate and steer community climate actions.

This approach also bridges scales of influence. When programs connect classroom learning to community projects and policy engagement, they establish leadership avenues where learners can practice skills, shape local agendas and ultimately enter national dialogues. The impactismagnifiedwheneducationinitiativesareintegratedintobroaderecosystems,linkingto finance mechanisms such as the Mastercard's Climate Impact Fund, technical fellowships like Marie Curie Fellowship and education platforms such as FFLE-A and GGP. These connections create cumulative opportunity structures that sustain leadership development. Continental strategies such as AU-GEWE, CESAandAgenda2063articulatethevisionforgender-responsiveclimateeducation;however, effective implementation requires concrete measures such as national budgeting, teacher training, gender-sensitive monitoring and partnerships with civil society and the private sector.

Theimplicationsforpolicyandpracticeareclear.Curriculumtransformationmustembedgender analysis, social justice and policy literacy within climate education, while also integrating practical community projects and entrepreneurship pathways. Teacher professional developmentisessential,equippingeducatorswithgender-responsivepedagogy,safeguarding skills and inclusive STEM facilitation, alongside adequate resourcing of schools with materials and connectivity. Leadership pipelines should be expanded through mentorship networks, internships and fellowships, with transition support in the form of capital, procurement access, andinstitutionalplacementstosustainleadershipbeyondtraining.Equallyimportantisdataand accountability. Establishing gender-disaggregated indicators for participation, leadership roles, and post-program outcomes ensure transparency and alignment with AU-GEWE and CESA targets. Finally, financing models must be innovative and inclusive. Blended finance can scale school-to-enterprisemodels,whilenationalpolicyinstrumentsshouldincentivize gender-inclusive procurement and innovation.

Insummary,gender-responsiveclimateeducationisnotonlyaboutteachingclimateliteracybutalso about building inclusive leadership pipelines that connect classrooms to communities, policies and global platforms, ensuring that women and girls are at the forefront of climate action.

6.0 CONCLUSION AND RECOMMENDATION

Africa's climate future will hinge on the inclusivity of its solutions, and inclusive solutions begin with education. Gender-responsive climate education cultivates leadership not only by transferring knowledge but by creating environments where women and girls can exercise agency, access resources, and shape decision-making. The programs analyzed, ranging from Education for Sustainable Development (ESD) initiatives to the Future Female Leaders in Energy–Africa (FFLE-A), the Green Girls Platform, the Mastercard Foundation's Climate Impact Fund, and the IAEA Marie Skłodowska-Curie Fellowship Programme, demonstrate how targeted interventions can translate continental visions into local impact. Aligning these initiatives with policy frameworks such as AU-GEWE, CESA, and Agenda 2063 reveals both enabling structures and execution gaps, underscoring the need for stronger linkages between policy aspirations and grassroots realities.

To enhance actionability, the study recommends that heads of schools establish extracurricular clubs dedicated to climate education, where students can engage in practical activities such as tree planting, waste management, and community awareness campaigns. These initiatives would embed climate action into everyday school life, fostering civic responsibility and resilience. Furthermore, school leaders should actively pursue grants and external funding from government agencies, NGOs, and international partners to sustain and expand such programs, particularly where financial aid is required. By embedding climate education into school culture and securing resources to support it, educators and policymakers can ensure that gender-responsive approaches are not only visionary but also practical, thereby positioning schools as critical actors in Africa's climate resilience agenda.

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