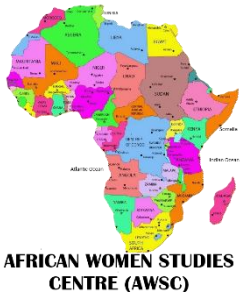
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Women as Central Actors in Climate Change Resilience: Roles in Agriculture, Food Security, Environment, and Disaster Preparedness

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Abstract

This article explores the pivotal role of women in advancing climate change resilience across key sectors, focusing on agriculture, food security, environmental conservation, and disaster preparedness. Drawing on case studies and empirical evidence from diverse global contexts, including South Sudan, we examine how women lead and contribute to climate adaptation efforts through their distinct knowledge systems, skills, and lived experiences, often undervalued in mainstream climate discourse. Our findings demonstrate that women's active participation in decision-making and their empowerment in resource governance significantly enhance community resilience to climate shocks. The research underscores women's contributions in sustainable agricultural practices, innovative food security solutions, ecosystem stewardship, and disaster risk reduction strategies. Yet, persistent structural barriers, such as gender-based discrimination, restricted access to resources, and exclusion from leadership, continue to limit their full engagement. We argue that centering women as agents of change is essential for crafting climate responses that are effective, equitable, and sustainable. Based on these insights, we offer policy recommendations to strengthen women's agency in climate resilience frameworks, including increased investment in women-led initiatives, integration of gender-responsive approaches in climate policy, and the systematic collection of gender-disaggregated data. The study concludes by affirming the urgency of embedding gender equity at the heart of climate policy and action.

Key words: *adaptation, agriculture, climate action, climate change resilience, disaster preparedness, environmental conservation, food security, gender equality, gender-responsive policies, intersectionality, sustainable development, women's empowerment, women's leadership*

1.0 Introduction

Climate change stands as one of the most urgent and complex global challenges of our time, with profound implications for ecosystems, economies, and societies. As its impacts intensify, the demand for effective, inclusive, and equitable resilience strategies becomes increasingly critical. Within this context, the role of women as central actors in building climate change resilience has gained recognition as both vital and underexplored.

This article examines the multifaceted contributions of women in responding to climate change, with a particular focus on their leadership and participation in agriculture, food security, environmental conservation, and disaster preparedness. Drawing on empirical research and case studies from diverse

global contexts, including South Sudan, we highlight the unique knowledge, skills, and perspectives that women bring to climate resilience-building efforts.

The urgency of this inquiry is underscored by growing awareness of the gendered dimensions of climate change. As Pearse (2017) notes, climate impacts are experienced differently by men and women due to entrenched gender inequalities, socio-economic disparities, and cultural norms. Understanding and addressing these differential impacts is essential for crafting resilience strategies that are not only effective but also just.

Moreover, this study seeks to address a significant gap in the current climate change discourse. Despite increasing attention to gender in climate discourse, women's voices and experiences remain underrepresented in policy and practice. Gay-Antaki and Liverman (2018) emphasise that many climate-related initiatives continue to overlook women's contributions, resulting in gaps that undermine the inclusivity and effectiveness of climate action. By centring women's roles and contributions, this paper seeks to contribute to a more comprehensive and gender-responsive understanding of climate change resilience.

Ultimately, recognizing and supporting women's contributions is not merely a matter of equity, it is a strategic imperative. Inclusive climate action that leverages women's expertise and leadership is essential to forging sustainable, adaptive, and transformative responses to the global climate crisis.

2.0 Background

The intersection of gender and climate change has garnered increasing scholarly and policy attention, revealing both the differentiated impacts of climate change and the critical roles women play in resilience efforts. This section outlines key concepts and theoretical frameworks that inform our understanding of women's roles in climate change resilience.

Gender intersects with climate change in at least three significant ways: differential vulnerability, differential adaptive capacity, and differential participation in decision-making (Arora-Jonsson, 2011). These dimensions underscore the need for resilience strategies that are attuned to gendered realities. Kaijser and Kronsell (2014) advocate for an intersectional approach, one that considers gender alongside class, race, age, and other axes of identity, to fully capture the complexity of climate impacts and responses.

Research increasingly affirms the value of women's ecological knowledge and resource management skills. Bee (2016) highlights women's contributions to sustainable adaptation, particularly in agriculture, where they play pivotal roles in food production and natural resource stewardship. Moreover, inclusive decision-making processes have been shown to yield more effective outcomes. Chauhan and Kumar (2016), for instance, document how women's leadership in Nepal's community forestry user groups has enhanced forest conservation and climate adaptation.

At the international level, gender integration in climate policy has gained traction. The United Nations Framework Convention on Climate Change (UNFCCC) has adopted key decisions, including the Lima Work Programme on Gender (2014) and the Enhanced Lima Work Programme with its Gender Action Plan (2019) (UNFCCC, 2019). Yet, as Huyer et al. (2020) caution, a persistent gap remains between policy commitments and implementation. Many climate policies and programs remain gender-blind, failing to adequately reflect women's needs, knowledge, and agency.

3.0 Justification

Centring women as key actors in climate change resilience is justified by several interrelated factors. First, women, particularly in developing countries, disproportionately experience the adverse effects of climate change due to entrenched gender inequalities and socio-economic vulnerabilities (Neumayer & Plümper, 2007). Understanding and addressing these inequities is essential for designing resilience strategies that are both effective and just.

Second, women possess invaluable traditional and local knowledge in domains such as sustainable agriculture, water management, and biodiversity conservation (Agarwal, 2018). Harnessing this knowledge is essential for developing effective climate adaptation strategies. In many communities, women serve as

primary stewards of natural resources, including water, fuel, and food, making their insights critical to sustainable resource management and climate adaptation (Carr & Thompson, 2014).

Third, empowering women in climate action offers transformative potential, not only to address climate challenges but also for advancing gender equality and catalysing broader social change (Tschakert & Machado, 2012). Recognising and supporting women's agency in climate resilience is thus both a strategic and ethical imperative.

Finally, despite recognition of the importance of gender in climate discourse, women's perspectives remain underrepresented in research, policy, and programmatic frameworks (Gay-Antaki & Liverman, 2018). This study seeks to address that gap by foregrounding women's contributions and advocating for more inclusive climate resilience approaches.

4.0 Problem Statement

Despite increasing recognition of women's contributions to climate resilience, several systemic challenges persist:

i. **Limited Representation:** Women continue to be underrepresented in climate-related decision-making at local, national, and international levels, restricting the integration of their perspectives and priorities (Kruse, 2014).

ii. **Structural Barriers:** Gender-based inequalities in access to education, resources, and economic opportunities hinder women's full participation in climate resilience efforts (Yadav & Lal, 2018). These barriers often intersect with other forms of marginalisation.

iii. **Data Gaps:** The lack of gender-disaggregated data on climate impacts and adaptation strategies impedes the development of responsive, evidence-based policies (Huyer et al., 2020). This data gap makes it difficult to fully understand and address the gendered dimensions of climate change.

iv. **Undervalued Knowledge**: Women's traditional and local knowledge is frequently overlooked in formal climate policies and programs, weakening the effectiveness of resilience efforts (Nyantakyi-Frimpong, 2019).

v. **Restricted Access to Finance**: Women in rural and marginalised communities face significant barriers in accessing climate finance and resources for adaptation and mitigation projects, limiting their ability to scale adaptation initiatives (Resurrección et al., 2019).

This study addresses these challenges by analysing women's roles in climate resilience, identifying barriers to their participation, and proposing strategies to enhance their agency and leadership in climate action.

5.0 Methodology

This study adopts a mixed-methods approach to explore women's roles in climate change resilience across multiple sectors. The methodology is intentionally designed to capture both the breadth and depth of women's contributions, experiences, and agency in responding to climate challenges.

6.0 Research Design

The research integrates several components:

i. **Literature and Policy Review:** A comprehensive review of academic literature, policy documents, and reports from international organisations was conducted to establish the theoretical framework and identify key themes, gaps, and emerging trends in gender and climate resilience.

ii. **Case Study Analysis:** Multiple case studies from diverse geographical contexts, with a particular focus on South Sudan and other developing countries, were examined to provide nuanced insights into women's roles in climate adaptation and mitigation.

7.0 Data Collection

The study employed both qualitative and quantitative methods:

7.1 Qualitative Methods

i. **Semi-structured interviews** were conducted with thirty women leaders and practitioners engaged in climate resilience efforts across agriculture, food security, environmental conservation, and disaster preparedness.

ii. **Six focus group discussions**, each comprising 8–10 women, were held in rural communities in South Sudan to gather perspectives on local climate challenges and adaptation strategies.

iii. **Observation**: Researchers also participated in community-level climate adaptation initiatives to observe women's contributions first hand.

7.2 Quantitative Methods

Where available, quantitative data on climate impacts, adaptation strategies, and women's participation in climate-related decision-making were analysed to complement qualitative findings.

7.3 Document Analysis

Relevant policy documents, project reports, and academic publications were reviewed to identify trends, best practices, and challenges in integrating gender considerations into climate resilience programming.

8.0 Data Analysis

The collected data were analysed using:

i. **Thematic Analysis:** Qualitative data from interviews and focus groups were coded to identify recurring themes and patterns related to women's roles, leadership, and barriers in climate resilience.

ii. **Comparative Analysis:** Case studies were compared to highlight common challenges and successful strategies across different contexts.

iii. **Content Analysis:** Policy and project documents were examined to assess the extent and quality of gender integration.

iv. **Statistical Analysis**: This was applied where appropriate to interpret quantitative data and support evidence-based conclusions.

9.0 Ethical Considerations

The research adhered to ethical guidelines for social science inquiry. Informed consent was obtained from all participants, and measures were taken to ensure confidentiality and protect the privacy of individuals and communities involved.

10.0 Limitations

While the study includes case studies from diverse contexts, it may not capture the full spectrum of experiences across all regions affected by climate change. The absence of comprehensive gender-disaggregated data in some areas may limit the depth of analysis. Additionally, the study offers a snapshot of current dynamics and may not fully reflect long-term trends. Despite these limitations, the mixed-methods approach and focus on diverse case studies provide a robust foundation for understanding women's roles in climate resilience and informing evidence-based recommendations to enhance their participation and agency.

11.0 Findings and Discussion

Our research underscores the multifaceted and indispensable roles that women play in building climate resilience across diverse sectors. This section presents and discusses our key findings, organised around six

thematic areas: climate-resilient agriculture, food security, water management, environmental conservation, sustainable energy practices, and disaster preparedness.

11.1 Women as Innovators in Climate-Resilient Agriculture

Women farmers are at the forefront of climate adaptation, drawing on intergenerational knowledge and experimenting with new techniques. In South Sudan, participants described sophisticated crop diversification strategies to buffer against erratic rainfall. As one woman shared during a focus group:

> *"We have learned from our mothers and grandmothers which crops can withstand drought and which ones need more water. Now, with the changing climate, we are experimenting with new combinations to ensure we have food throughout the year."*

This observation aligns with findings from East Africa, where women have adopted climate-smart practices such as intercropping and agroforestry to enhance soil fertility and water retention (Jost et al., 2016).

Women also play a vital role in seed selection and conservation, which is critical for maintaining crop diversity and resilience to climate change. In South Sudan, women described selecting seeds from drought-surviving plants and storing them using traditional methods that protect against pests and moisture. This mirrors practices in Malawi, where women preserve indigenous crop varieties better suited to climate stress (Bezner Kerr et al., 2019).

11.2 Guardians of Water: Women's Leadership in Water Management

Across many communities, women are primary stewards of water for both household and agricultural use. In response to increasing water scarcity, women in South Sudan have led the construction of small-scale water harvesting systems and adopted efficient irrigation techniques. These grassroots innovations echo efforts in Nepal, where women have spearheaded the revival of traditional water sources and the installation of storage tanks (Khamis et al., 2014).

11.3 Sustaining Food Security Through Livelihood Diversification

Women are proactively diversifying household livelihoods to buffer against climate-induced food insecurity. In South Sudan, many women have turned to small-scale trading and food processing to supplement agricultural income. One interviewee explained:

> *"When the rains are poor and crops fail, we need other ways to feed our families. Many of us have started small businesses selling processed foods or handicrafts. This helps us buy food when our harvests are not enough."*

This trend reflects broader patterns across Africa and Asia, where women are engaging in climate-resilient livelihoods such as livestock rearing and non-timber forest product collection (Rao et al., 2019).

Women also play a pivotal role in household nutrition, especially during periods of scarcity. In South Sudan, women are adapting traditional recipes and incorporating wild edibles into family diets to maintain nutritional diversity during periods of scarcity. This resonates with findings from other contexts, where women lead nutrition-sensitive agricultural practices in response to climate change (Gabrysch et al., 2019).

11.4 Champions of Environmental Conservation

Women are leading community-based efforts in sustainable resource management and biodiversity conservation. In South Sudan, women-led groups are driving reforestation initiatives and promoting sustainable firewood collection. These efforts contribute to both climate mitigation and adaptation. Similar leadership has been documented in Mali, where women have taken active roles in forest restoration and governance (Djoudi & Brockhaus, 2011).

11.5 Women Promoting Sustainable Energy Practices

Women play pivotal roles in advancing sustainable energy practices at both household and community levels. In South Sudan, our study found that women are leading in the adoption of clean cooking technologies and solar energy solutions, interventions that not only reduce deforestation and indoor air pollution but also strengthen climate resilience. These findings echo global research, such as Mohideen (2018), which underscores women's leadership in promoting and implementing renewable energy solutions in rural settings.

11.6 Women, Disaster Preparedness and Response

In the realm of disaster preparedness and response, women demonstrate unique knowledge systems and adaptive capacities that bolster community resilience. Our research revealed that women often function as informal early warning systems for climate-related disasters, drawing on their intimate understanding of environmental cues. As one community leader explained,

> *"We can tell when floods are coming by observing changes in plants and animal behaviour. This knowledge helps us prepare and warn others."*

This insight aligns with findings from Drolet et al. (2015), who document the critical role of women's traditional ecological knowledge in early warning and disaster preparedness across diverse cultural contexts.

Women also play essential roles in post-disaster recovery and reconstruction efforts. In South Sudan, women-led organisations are at the forefront of coordinating relief efforts, managing temporary shelters, and facilitating community rebuilding after climate-related disasters. These contributions mirror global evidence, including Enarson and Chakrabarti (2009), which highlight women's leadership in disaster recovery and advocate for gender-sensitive approaches to disaster risk reduction.

Despite these significant contributions, our research also identified persistent structural barriers that continue to hinder women's full participation in climate resilience initiatives. Gender-based discrimination and unequal power dynamics limit women's access to resources, decision-making platforms, and leadership roles. In South Sudan, while women are often the primary implementers of climate adaptation strategies within households, they are frequently excluded from community-level planning and policy-making processes. This exclusion not only undermines women's agency but also deprives climate initiatives of critical insights and lived experiences.

Limited access to education and climate-related information further constrains women's adaptive capacities. Our research found that women in rural areas often lack the technical knowledge and timely information needed to make informed decisions. As one focus group participant shared,

> *"We know the climate is changing, but we don't always understand why or how to respond. We need more information and training to make better decisions."*

This finding resonates with Ampaire et al. (2020), who emphasise the importance of gender-responsive climate information services in enhancing women's resilience.

Finally, the burden of unpaid care work significantly restricts women's ability to engage in climate action. Many women in South Sudan struggle to balance household responsibilities with participation in community climate initiatives. This double burden not only limits their time and energy but also reinforces systemic gender inequalities. Similar dynamics have been documented globally, as noted by Resurrección (2013), who calls for recognition of the gendered division of labour in climate adaptation strategies.

12.0 Recommendations

Based on our findings, we propose the following recommendations to strengthen women's roles as central actors in climate change resilience.

12.1 Mainstream Gender in Climate Policies and Programs

Governments and organizations must embed gender analysis throughout the lifecycle of climate policy comprising design, implementation, monitoring, and evaluation. This includes conducting gender impact assessments, setting gender-responsive targets, and earmarking resources to advance women's empowerment in climate action.

12.2 Increase Women's Representation in Climate Decision-Making

Adopt quotas and other affirmative action measures to ensure women's meaningful participation in climate governance at local, national, and global levels. Complement these with capacity-building initiatives that equip women to lead and influence climate-related decisions.

12.3 Invest In Gender-Responsive Climate Finance

Establish financing mechanisms that prioritize women-led climate initiatives and guarantee equitable access to climate funds. Simplify application procedures, offer technical assistance, and create dedicated funding windows for women's organisations.

12.4 Expand Women's Access to Climate Information and Technology

Design climate information services that reflect women's specific needs and preferences. Pair these with efforts to boost digital literacy and facilitate access to climate-smart technologies, particularly in underserved communities.

12.5 Recognise and Integrate Women's Traditional Knowledge

Systematically document, validate, and incorporate women's local and traditional ecological knowledge into formal climate strategies. Facilitate platforms for inter-community knowledge exchange to amplify women's voices and innovations.

12.6 Address Structural Gender Inequalities

Advance broader gender equality reforms that tackle the root causes of women's climate vulnerability such as inequities in land tenure, education, and economic opportunity. These reforms are foundational to building inclusive climate resilience.

12.7 Promote Women's Leadership in Climate-Resilient Sectors

Launch targeted programs that support women's entrepreneurship and leadership in renewable energy, sustainable agriculture, and green technologies. These sectors offer transformative potential for both climate resilience and gender equality.

12.8 Strengthen Gender-Disaggregated Data Systems

Invest in robust collection, analysis, and use of gender-disaggregated data on climate impacts, vulnerabilities, and adaptation strategies. Evidence-based insights are essential for designing responsive and equitable climate policies.

13.0 Conclusion

This study affirms that women are indispensable agents of climate resilience, innovating in agriculture, mobilizing communities, and stewarding ecosystems. Our research in South Sudan, alongside global case studies, underscores the depth of women's ecological knowledge, their leadership in resource management, and their capacity to drive collective action.

Yet, persistent barriers such as gender-based discrimination, limited access to resources and decision-making, and the burden of unpaid care work continue to constrain women's full participation. Overcoming these challenges is not only a matter of justice but a strategic imperative for effective climate action.

The recommendations outlined here aim to create enabling environments where women's contributions are recognised, supported, and scaled. By embedding gender equality at the heart of climate strategies, we unlock the full potential of women's leadership in building resilient communities and ecosystems.

As climate impacts intensify, the global community must embrace a change in basic assumptions, one that centres women's empowerment in every facet of climate response. Future research should deepen our understanding of intersectional dynamics and track the long-term outcomes of gender-responsive climate initiatives, identifying scalable models for inclusive resilience.

Empowering women is not only a moral imperative: it is a practical necessity. Their knowledge, skills, and leadership are vital to forging a climate-resilient future. Let us ensure that gender equality remains a guiding principle in shaping the policies, programs, and practices that define our collective climate response.

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