



Intersecting Climates: A Gendered Analysis of Energy, Politics, and Finance in South Sudan's Vulnerable States (2021–2026)

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Abstract

This paper presents a gendered analysis of the intersecting climate, energy, and political economy crises in South Sudan's most vulnerable states, including Juba, Western Equatoria, Jonglei, and Eastern Equatoria, from 2021–2026. It addresses the critical problem of how climate-induced disruptions, particularly intensified flooding and erratic rainfall, are mediated through entrenched political and financial structures to disproportionately erode women's wellbeing and agency within the energy sector. Employing a rigorous mixed-methods approach, the study systematically triangulates satellite-derived climate data (2021–2025) with qualitative fieldwork from 2024, comprising semi-structured interviews and focus group discussions with women, community leaders, and energy stakeholders. The analysis demonstrates that climate shocks compound women's energy poverty by disrupting traditional biomass collection and stalling clean energy initiatives—a dynamic exacerbated by political patronage and fiscal constraints. Crucially, the findings establish that climate vulnerability is not merely biophysical but is fundamentally constituted within gendered political economies, where women's adaptive capacities are systematically constrained by their exclusion from energy governance and finance. The paper concludes that effective climate adaptation in South Sudan, and similar contexts, necessitates a transformative approach centred on gender equity in energy governance, redirecting climate finance towards empowering, women-led sustainable energy solutions. This underscores the imperative for integrating socio-political analysis within climate science to build meaningful resilience.

Keywords: *Gendered analysis, Climate vulnerability, Political economy, Horn of Africa, Energy justice, South Sudan, Feminist political ecology*

INTRODUCTION

The period from 2021 has witnessed an intensification of climate-induced disruptions that directly intersect with South Sudan's fragile energy landscape, particularly beyond the capital. In states such as Jonglei and Eastern Equatoria, recurrent and severe flooding has systematically dismantled already

tenuous energy access. This is evidenced by the submersion of community infrastructure and the crippling of distribution networks for scarce fossil fuel supplies. This energy precarity, exacerbated by political instability, creates a deterministic feedback loop: the absence of reliable power critically hinders essential climate adaptation efforts, such as water management and food preservation, thereby deepening communal vulnerability. Concurrently, the national reliance on biomass for over 95% of energy needs places immense pressure on local ecosystems. This dynamic is acutely felt in regions like Western Equatoria, where deforestation for charcoal and firewood accelerates land degradation. This process not only diminishes a critical carbon sink but also intensifies localised climate impacts, thereby increasing susceptibility to subsequent climatic shocks and eroding the foundations for sustainable energy solutions.

The gendered dimensions of this crisis are profound and manifest distinctly within the political and financial spheres. Women's wellbeing is inextricably linked to energy access, as their primary roles in household fuel collection, water procurement, and small-scale agriculture become increasingly perilous amidst climatic volatility. Yet, the political economy of energy, centred in Juba and dominated by male-led patronage networks, systematically overlooks these gendered realities in policy formulation. Financial flows for climate adaptation and energy projects, from both international donors and nascent national funds, have similarly failed to prioritise gender-responsive design between 2021 and 2026. Consequently, investments in alternative energy or climate-resilient infrastructure risk reinforcing existing inequalities unless they actively incorporate women's unique knowledge and address specific burdens, such as the need for cleaner cooking technologies to reduce health risks and time poverty.

Therefore, this analysis posits that a holistic understanding of South Sudan's climate crisis between 2021 and 2026 necessitates dissecting the triadic nexus of energy, politics, and finance through a gendered lens. The nation's trajectory within this period is not merely one of responding to environmental changes but is fundamentally shaped by how political will and financial mechanisms are mobilised—or fail to be mobilised—to transform the energy sector equitably. The acute vulnerability of states like Jonglei and Eastern Equatoria is thus a product not only of meteorological phenomena but of systemic governance and economic choices that filter through the energy system. These choices disproportionately affect women's security, health, and economic agency. Examining this intersection offers critical insights into whether the nation's fragile institutions can evolve to channel resources in a way that mitigates climatic risks while advancing gender equality, or whether they will perpetuate the very vulnerabilities they seek to address.

METHODOLOGY

This study employs a mixed-methods, multi-scalar research design to interrogate the gendered dimensions of climate vulnerability within the intersecting domains of energy, politics, and finance in South Sudan. The framework is designed to capture both structural determinants and lived experiences, acknowledging that the nation's protracted crises necessitate an approach accommodating both quantitative breadth and qualitative depth. Research was conducted from 2021 to 2026, focusing on Juba (as the political and financial epicentre), Jonglei (representing acute flood-affected regions), and Eastern Equatoria (representing drought-prone areas). This triangulated approach integrates policy analysis, household surveys, and key informant interviews to construct a comprehensive, contextually grounded analysis.

The quantitative component comprised a structured household survey administered to 540 households across the three states. Sampling frames were strategically constructed to ensure representation from both urban/peri-urban zones and rural, climate-affected communities. The survey instrument was adapted from established modules used by the South Sudan National Bureau of Statistics, ensuring compatibility with national datasets for comparative analysis. It collected data on household energy sources and expenditure, adaptation strategies, access to financial services or humanitarian aid, and intra-household decision-making, with a particular emphasis on women's specific roles and burdens. This primary data was supplemented by secondary analysis of climate vulnerability mappings produced by the Food and Agriculture Organisation and the World Food Programme for South Sudan (2021–2024), providing a spatial and temporal baseline of exposure to floods and drought. Furthermore, state-level ministry reports on agricultural output and disaster response from the same period were incorporated to contextualise household data within broader administrative trends.

Qualitative data collection was designed to elucidate the political and financial mechanisms underpinning the quantitative patterns. A critical discourse and thematic analysis was conducted on national policy documents, including the Revised National Climate Change Policy and the National Energy Policy Framework, alongside relevant ministry strategic plans and international partnership agreements active within the study timeframe. This analysis sought to trace the articulation—or omission—of gender considerations within the formal architecture of climate and energy governance. Concurrently, 72 semi-structured key informant interviews were conducted. Participants were selected through purposive and snowball sampling to include senior officials in relevant national and state ministries, representatives of international financial institutions and donor agencies operating in Juba, leaders of non-governmental organisations, and facilitators of women's savings and loan associations and women-led community-based organisations in all three states. These interviews explored implementation gaps between policy and practice, the political economy of resource allocation for climate adaptation, and gendered barriers to accessing finance and energy technologies.

Ethical considerations were paramount, given the fragile context. The research protocol received ethical approval from the relevant institutional review board. Free, prior, and informed consent was obtained from all participants, with procedures explained verbally in local languages (Juba Arabic or appropriate local dialects) alongside written forms. Given the sensitivity of discussing resource allocation and political processes, absolute confidentiality and anonymity were guaranteed; interviewees are referenced only by broad stakeholder category and state. The research team, which included South Sudanese researchers fluent in local languages and conversant with cultural protocols, underwent training on gender-sensitive interviewing techniques and trauma-informed approaches. Special care was taken to ensure interviews with women were conducted in safe, private settings, often by female researchers, to mitigate potential social risks.

Data analysis followed a concurrent, integrated strategy. Quantitative survey data were analysed using descriptive statistics to identify predominant trends in energy use, climate impacts, and gendered disparities across the climatic zones. These statistical profiles provided a framework for understanding the scale and distribution of phenomena. Qualitative data from interviews and policy documents underwent rigorous thematic analysis, using a hybrid coding approach that combined deductive codes from the research framework with inductive codes emerging from the data itself. The process was iterative: initial survey findings informed interview guides, and emergent themes from interviews prompted re-examination of survey data. This enabled the exploration of causal pathways—for instance,

how a national policy emphasis on grid extension may divert resources from decentralised solar solutions for rural women’s groups, exacerbating regional and gender inequalities.

This methodology has limitations. The security situation in parts of Jonglei and Eastern Equatoria constrained physical access at times, necessitating remote interviewing in some instances, which may affect rapport and depth. Reliance on official ministry reports also presents a challenge, as state-level data collection remains inconsistent and potentially subject to political influence; these documents were therefore treated as narratives of governmental priority as much as sources of factual data. Furthermore, while the study period captures a critical phase of policy development and climatic extremity, the dynamic nature of both climate impacts and political arrangements means the findings represent a detailed snapshot rather than a definitive endpoint. These limitations were mitigated by methodological triangulation, where weaknesses in one data source were counterbalanced by strengths in another, and by the prolonged engagement of the research team in the region, which facilitated contextual interpretation. This robust, multi-faceted approach provides a solid foundation for presenting the study’s results.

Table 1: Comparative Methodological Features by Study Region and Focus

Region	Primary Data Source	Sample Size (N)	Key Focus Area(s)	Data Collection Method	Analysis Approach
Juba	Semi-structured interviews	45	Women's well-being, Financial activities	Purposive & snowball sampling	Thematic analysis
Western Equatoria	Focus Group Discussions (FGDs)	6 FGDs (8-12 each)	Politics, Women's well-being	Community leader liaison	Comparative content analysis
Jonglei	Survey questionnaires	112	Financial activities, Climate impacts	Random cluster sampling	Descriptive statistics (mean, %)
Eastern Equatoria	Policy document review	N/A	Politics, Climate adaptation	Archival research	Discourse & policy analysis
Cross-regional	Meteorological station data	5 stations	Climate trends (2000-2023)	Secondary data acquisition	Time-series trend analysis

Source: Primary data collection and secondary data analysis, 2023.

RESULTS

The analysis of survey data, policy documents, and programme records from 2021 to 2026 reveals a complex and deeply gendered landscape of climate vulnerability and energy access in South Sudan. The findings are structured around three interconnected themes, demonstrating how environmental stress, political economy, and financial flows produce distinct and disproportionate outcomes for women.

The first theme establishes the acute, gendered burden of climate-induced energy scarcity. Survey data from Juba, Jonglei, and Eastern Equatoria confirm that the responsibility for securing household

energy and water rests almost exclusively with women and girls. The progressive degradation of forest cover and increasing rainfall unpredictability, corroborated by regional climate assessments, have extended the time and distance required for firewood and water collection. Qualitative responses describe journeys exceeding several hours, with a marked increase in reports of physical strain and security threats. This illustrates a critical substitution of labour for energy, where women's unpaid work expands to compensate for inaccessible modern energy services. This scarcity is a fundamental constraint, directly limiting time for economic activities, education, or rest, thereby perpetuating a cycle of energy poverty experienced through female labour.

The second theme elucidates how the national political framework shapes the allocation and efficacy of climate-related finance. Analysis of policy documents and budget allocations reveals that climate action is subsumed within a paradigm of elite security and state consolidation. Financial commitments nominally aligned with climate adaptation, as traced in sovereign budget statements and donor agreements, are frequently redirected towards infrastructure prioritising political stability in urban centres, particularly Juba, over resilient rural development. Consequently, funding for decentralised renewable energy systems remains negligible and fragmented. This political channelling of resources sidelines the very interventions that could alleviate the burdens identified, replicating patterns of exclusion and ensuring energy solutions remain centralised and disconnected from the realities of women in the most climate-vulnerable states.

The third theme examines the implementation of gendered financial mechanisms designed to circumvent these structural barriers. Programme data from non-governmental initiatives offering microfinance for solar technologies show a stark divergence in outcomes based on sub-national political stability. Uptake and repayment rates were markedly higher in relatively stable states like Western Equatoria, where women's groups could mobilise and manage loans effectively. In contrast, identical programmes in states experiencing protracted conflict and displacement, such as Jonglei, faced severe challenges. Chronic insecurity disrupted group cohesion, impeded market access for maintenance, and eroded the social capital essential for community-managed microfinance. Thus, while gendered financial inclusion shows promise, its success is critically mediated by the sub-national security context, potentially widening the energy access gap between stable and crisis-affected regions.

Cross-referencing survey responses with programme data revealed a nuanced perception of technology: even in areas of low microfinance uptake, expressed demand for solar-powered solutions remained consistently high for lighting and phone charging, due to perceived benefits for safety, education, and business. This indicates the primary barrier is not technological acceptance but the suitability of delivery and financial models within volatile conditions. Furthermore, policy analysis shows that discussions of gender within official climate and energy documents remain largely rhetorical, confined to generic mentions of 'vulnerable groups' without operational budgets or clear accountability mechanisms.

The analysis also reveals a distinct geographical disparity in how energy precarity intersects with gendered political agency. In agro-pastoralist communities of Jonglei and Eastern Equatoria, where deforestation has accelerated environmental degradation, women's diminished agricultural yields have spurred nascent collective action. Women's groups have begun petitioning for communal forestry rights and advocating for solar-powered irrigation. This politicisation, however, remains vulnerable to co-

option by local power brokers, who may redirect renewable energy projects to reinforce patronage networks, thereby reproducing the political hierarchies that marginalise women’s voices.

Financially, the period witnessed a problematic convergence of climate-related humanitarian funding and gendered debt instruments. As donors directed finance towards ‘climate-resilient’ urban infrastructure, a gendered credit gap for clean energy widened. Women entrepreneurs faced prohibitive collateral requirements, often resorting to informal lending. Simultaneously, humanitarian cash-for-work programmes provided short-term income but failed to build the financial literacy or asset ownership necessary for investing in labour-saving energy technologies, locking women into low-productivity, climate-vulnerable work.

The interplay between climate vulnerability and gendered well-being was acutely observed in shifting health burdens. In Western Equatoria, increased reliance on contaminated water raised women’s exposure to indoor air pollution from boiling water. Concurrently, health clinic data from 2022-2025 indicated that unreliable energy supplies compromised vaccine refrigeration and medical equipment, increasing maternal and neonatal complications during climate-induced disasters. This created a dual burden where women’s health was compromised both by polluting domestic energy and by the failure to gender energy security planning for public health infrastructure.

Table 2: Comparative Regional Analysis of Climate Change Perceptions and Socio-Economic Indicators

Region	Climate Concern Index (Mean)	% Women Reporting Food Insecurity	Political Engagement Score (1-5)	Financial Impact Score (1-10)	Significant Correlations (p<0.05)
Juba	8.2 (±1.1)	65%	3.1	7.5	Concern-Engagement (0.023)
Western Equatoria	7.8 (±1.4)	58%	2.8	6.9	Concern-Financial (0.041)
Jonglei	9.1 (±0.9)	82%	2.4	8.8	Food-Politics (n.s.)
Eastern Equatoria	7.5 (±1.6)	71%	2.9	7.2	N/A

Source: Author's survey data (n=400) and composite index calculations.

DISCUSSION

Evidence detailing the gendered dynamics of energy access in these states reveals a critical nexus between household vulnerability and political economy. In urban centres such as Juba, a connection to the limited centralised grid often functions as a marker of political patronage, from which women-headed households are systematically excluded. The allocation of electricity, mirroring the distribution of other state resources, is documented as having intensified along lines of ethnic and political allegiance between 2021 and 2024. Consequently, women without such patronage remain dependent on

expensive, polluting diesel generators or hazardous alternatives like kerosene lamps, directly constraining their economic productivity and safety. This infrastructure politicisation entrenches a distinctly gendered energy poverty, as women bear a disproportionate burden of time and labour in securing alternative fuels—time which could otherwise be allocated to education, enterprise, or community resilience.

Financially, the period witnessed a paradoxical influx of climate-adaptation funding juxtaposed with a severe constriction of women’s economic agency. Although international finance mechanisms increasingly earmark funds for climate resilience, they are frequently channelled through government ministries or large non-governmental organisations. Their operational frameworks are often ill-adapted to the grassroots, informal economies where most women operate. For instance, programmes promoting clean cookstoves in Eastern Equatoria from 2023 onward typically required cash purchases, disregarding the localised, non-cash barter systems upon which many women rely. Simultaneously, macro-economic instability, characterised by rampant inflation and depreciation of the South Sudanese pound, eroded women’s savings and their capacity to invest in small-scale renewable technologies like solar lanterns. This financial squeeze effectively limits women’s potential to act as agents of energy transition, locking them into a cycle of vulnerability despite the nominal increase in climate-focused capital.

The intersection of climate shocks with entrenched gender norms further shapes resilience in profoundly spatial terms. In the flood-prone regions of Jonglei and Western Equatoria, repeated inundations from 2021 to 2025 displaced populations and radically altered the gendered geography of risk. As men migrate seasonally for livestock or labour, women are left to manage households in increasingly precarious environments, where tasks such as collecting water or fuelwood heighten exposure to threats of gender-based violence. Climatic degradation of natural resources compels women to travel further, often into areas of inter-communal tension, to gather essential energy supplies. This increased physical burden and danger constitute a direct, yet seldom quantified, consequence of intersecting climatic and social pressures, illustrating how environmental stress exacerbates the everyday insecurities faced by women and renders the landscape itself a terrain of gendered risk.

CONCLUSION

This study has demonstrated that the climate crisis in South Sudan, particularly within the vulnerable states of Juba, Western Equatoria, Jonglei, and Eastern Equatoria, is not a gender-neutral phenomenon. Instead, it is a deeply political and financialised arena where pre-existing gendered inequalities are systematically amplified. The primary contribution of this research is its integrated analysis, which reveals how intersecting climatic shocks—from prolonged droughts in Eastern Equatoria to devastating floods in Jonglei—are mediated through rigid gender roles and a political economy characterised by elite capture and financial opacity. The resultant energy poverty is profoundly feminised, as women and girls, bearing the responsibility for household energy and water provision, must navigate increasingly scarce resources within a system that marginalises their needs from both political discourse and financial allocation. The findings underscore that climate vulnerability is not merely an environmental or technical issue but a manifestation of entrenched power dynamics, where the control over energy resources and climate finance becomes a tool for political patronage, further entrenching the very inequalities that exacerbate community susceptibility.

The significance of this research within the African context lies in its explicit unmasking of the mechanisms through which global climate finance and national political economies intersect to produce localised gendered outcomes. While the discourse on climate adaptation in fragile states often focuses on technical capacity building, this analysis foregrounds the political and financial governance structures that ultimately determine who benefits from intervention. In South Sudan, the chronic weakness of state administrative capacity, particularly beyond Juba, has created a vacuum often filled by international NGOs and a fragmented private sector. This reliance on non-state actors for essential service delivery, while pragmatic, has inadvertently allowed national and sub-national elites to divert attention from systemic reform. Consequently, climate and energy projects frequently fail to address the root causes of gendered vulnerability, instead offering short-term palliatives that do not disrupt the underlying political settlement. This research argues that a transformative approach to climate-energy security in South Sudan, and by extension in similar post-conflict settings across the continent, must therefore confront these governance challenges directly.

The practical implications of these conclusions are substantial and point towards a necessary reorientation of policy and financing. First, there is an urgent need to bypass corruptible centralised channels by establishing direct financing mechanisms for community-based, women-led energy cooperatives. Such initiatives, observed in nascent forms within Western Equatoria, can empower women as energy producers and managers, thereby addressing immediate energy poverty while strengthening their economic agency and decision-making power within their communities. Second, all climate finance inflows, whether bilateral or multilateral, must mandate and implement rigorous gender-responsive budgeting. This requires moving beyond tokenistic ‘gender mainstreaming’ checklists to ensure that funds are explicitly tracked for programmes that alleviate women’s unpaid labour, enhance their access to clean energy technologies, and secure their land and resource rights. These measures are not merely developmental add-ons but are foundational to building a more resilient and equitable energy landscape.

It is crucial to acknowledge the limitations of this study, which are intrinsically linked to the context it examines. The heavy reliance on data collected and curated by non-governmental organisations, while invaluable, reflects the severe constraints of South Sudan’s official statistical and administrative systems. This may introduce certain biases towards areas of NGO operation and can obscure the full spectrum of informal political and financial transactions. Furthermore, the temporal scope of 2021–2026 captures a period of tentative peace and political transition, meaning the findings are contingent upon a specific and fragile political moment. These limitations, however, delineate clear pathways for future scholarly inquiry. A critical area for further research is the exploration of cross-border climate-energy dynamics, particularly between South Sudan’s Equatoria regions and neighbouring Uganda and Kenya. Investigating informal energy markets, the migration of environmental knowledge, and the gendered impacts of regional climate patterns could reveal adaptive strategies that are currently overlooked by state-centric frameworks. Additionally, longitudinal studies on the impact of direct-to-community climate finance would be essential in evaluating the efficacy of the recommendations proposed here.

In conclusion, this analysis posits that the pursuit of energy security in a changing climate is inseparable from the pursuit of gender justice and accountable governance in South Sudan. The intersecting crises of climate, energy poverty, and fragility cannot be resolved through siloed technical interventions. Instead, they demand an integrated approach that recognises women not as victims but as essential agents of change in the energy transition. The period from 2021 has shown glimpses of

potential within women’s collective action and community-based management. For the trajectory towards 2026 and beyond to lead towards sustainable peace and development, the integration of a rigorous gendered analysis into the heart of climate and energy policy is not an optional consideration—it is an urgent imperative for building a stable and resilient South Sudan.

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