



Gendered Vulnerabilities to Climate Change: Insights from Bor County, Jonglei State of South Sudan

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Abstract

Documented evidence suggests that South Sudan is one of the most vulnerable countries regarding climate change. The vulnerability varies in different disaggregated groups of people, based on their societal position in a socially and gendered structure within a spatio-temporal space. This underlines the importance of understanding what may be referred to as “contextual conditions” that underpin the gender experiences of vulnerability to external shocks. This paper draws on evidence obtained from a field study in Bor County of Jonglei State of South Sudan and secondary data. It takes the position that not only is gender a powerful and pervasive contextual condition, but it also intersects with other existing factors. Therefore, manifestations of gendered vulnerability to climate change are the results of complex and interlinked factors. The paper offers some insights into understanding gendered vulnerabilities in Bor County. It concludes that gendered vulnerabilities to climate change and conflict are embedded in gender roles, traditional livelihoods, cultural norms, marital practices and resilience mechanisms. It recommends modernization and incorporation of indigenous knowledge in climate resilience action, measures to ensure that livelihood opportunities do not benefit men at women’s expense, identification and maximization of economic opportunities in women’s traditional domains such as milk processing and community conversations on cultural norms and practices that perpetuate women’s subordination.

Subject Areas

Environmental Sciences

Keywords

Gender, Climate Change, Floods, Conflict, Resilience, Capacities, Vulnerability,

1. Introduction

South Sudan is one of the most vulnerable countries to climate change and associated socio-economic losses and damages due to the dependence of its population on climate-sensitive natural resources for their livelihoods [1]. The effects of climate change include increased temperatures, fluctuations in precipitation and more frequent droughts and floods [2]. With a temperature increase of 2°C, water levels could fall by 50 per cent, disrupting the flow of the Bahr el Ghazal and Sobat rivers and negatively affecting local communities and natural resources [3]. Approximately 90 per cent of the land in South Sudan is arable, but only around 5 per cent is currently cultivated. Some 95 per cent of the population depends on climate-sensitive livelihoods, primarily traditional rain-fed crop farming and pastoralism [4]. However, even in good harvest years, 7 million people—60 per cent of the population—suffer from food insecurity [5], which weakens community resilience [6]. The droughts and flooding, compounded by insecurity, lead to severe food insecurity and a human crisis [7]. If anthropogenic causes are not halted or drastically reduced, the situation will deteriorate [8].

In Bor County of Jonglei State, environmental variations attributed to global climate change have led to unpredictable situations that have complicated pastoral production systems, severely limiting their potential [9]. Moreover, changing patterns of land use and increased water demand have led to desertification and water source depletion [10]. The gendered vagaries of climate change are exacerbated by conflict, which, in South Sudan, has been going on since 2013, resulting in displacement and increased vulnerability, especially of women, children and the elderly [1] (BRACED, 2018). Women are particularly affected by these conditions since they are the primary providers of household food, water and fuel [11].

[12] demonstrates that the effects of climate change are not gender-neutral. This is evident in: changes in men's and women's time use and workloads; compromised nutritional status as food becomes rationed; and poorer health and reproductive capacity, especially of women.

This paper is based on a study carried out in Bor County of Jonglei State, South Sudan by a team of researchers from Kenyatta University in 2023 under the project called "Building Gender Responsive Climate Resilient Communities in South Sudan", sponsored by the Supporting Pastoralism and Agriculture in Recurrent and protracted Crisis (SPARC) Programme.

The overall objective is to present scientific literature and primary data on gendered vulnerabilities with specific reference to Bor County of Jonglei State in South Sudan. More specifically, the study sought to:

- 1) Identify the gender-differentiated effects of conflict and climate change on inhabitants of Bor County, Jonglei State of South Sudan.

2) Propose gender-responsive adaptation measures in the context of climate change and conflict in Bor County, Jonglei State of South Sudan.

2. Problem Statement

Gender is an important variable in climate change adaptation and mitigation. A thorough understanding of and response to gendered vulnerabilities and capacities ensures that both women and men benefit from climate resilience actions. Unfortunately, most policies focusing on developing and reinvigorating the adaptive capacity of local communities fail to acknowledge the gendered nature of lived experiences [13] [14]. Consequently, they fail to formulate appropriate gender-responsive policy actions [15].

When the experiences are highlighted, women are typically portrayed as vulnerable, weak, poor and socially isolated, rather than as actively negotiating and dealing regularly with different kinds of changes in their lives [16]. On the other hand, men are virtually invisible from much of this discourse. If mentioned, they are depicted as perpetrators of women's vulnerability. There is a further important omission in this discourse. Both research and policy are often framed in terms of climate change impacts alone. Developing a broad-based understanding of gendered vulnerabilities is therefore central to analyzing women's and men's ability to cope with and adapt to climate change [17].

3. Literature Review

In earlier discourse, "vulnerability" referred to the capacity to be wounded [18]. From the early 1980s, the concept was linked with exposure to biophysical risks [19]. Today, it is regarded as a predisposition to be adversely affected [8]. In the context of climate change, vulnerability encompasses a variety of concepts and elements, including sensitivity or susceptibility to harm and lack of capacity to cope and adapt [20] as well as to moderate harm [21].

Emerging literature lends support to the hypothesis that vulnerabilities associated with climate change are gendered [17] [22]-[30]. Thus, women and men experience climate change and associated hazards differently [12] [31]. The impacts of these changes can exacerbate the already existing social inequalities and "compound the vulnerabilities of those who are in a subordinate position in the social and gender structure" ([31], p. 11).

An understanding of different adaptive strategies employed by men and women to secure their livelihoods, both in the short and medium term, is, however, not sufficient [32]. While access to resources (such as land, livestock, water and money) is crucial, its linkage to social roles, norms, values and cultural identities in different contexts requires further investigation [26] [33]. While women and girls, by and large, are frequent victims of the impacts of hazardous shocks, this should not be construed to mean that they are intrinsically and inevitably susceptible to such events [15]. Equally, men and boys are vulnerable to climate change, but in different ways from women and girls. This is because gender-related effects

of climate change are rooted in the different roles, rights and opportunities, which are culturally defined [12].

Because gender and gendered differences are socially constructed, reflecting the legitimized social and cultural norms at a particular spatial and temporal juncture [31], they change over time and in space to reflect evolving realities [34] [35]. When integrating gender into an understanding of vulnerability to climate change impacts and disasters, it is therefore critical to ensure “more agile understandings of women and men” ([36], p. 41) that reflect how gendered experiences are the outcomes of such intersectionality [15].

This paper conceptualizes vulnerability not just as a characteristic of some groups, but as a condition produced and driven by a wide variety of conditions embedded in everyday power relations and the political economy, and inflected by social capital [37], gender [25] and ethnicity [38], among other variables. In this sense, vulnerability describes conditions derived from historical and prevailing cultural, social, environmental, political and economic contexts.

Going hand in hand with vulnerability is resilience. According to the Oxford English Dictionary, the first reference to resilience was by Francis Bacon in the 17th Century. This was to describe the physical characteristics of an echo and how it bounces off a wall. Thus, resilience meant “to bounce back”. Although the definition has evolved, one residual aspect is that there must be something to bounce back from and to ricochet.

About climate change, resilience is the ability to withstand environmental pressures through the use of culturally mediated practices. It is about successfully coping with and managing the impacts of climate change while preventing them from getting worse. When overwhelmed by events, however, the cultural practices may collapse.

The academic study of resilience can be examined through the work of [39], which sought to understand the mechanisms applied by individuals and groups to achieve it. Individuals build resilience by learning how to deal best with stress or create preventive mechanisms. This is dependent on individual actors’ personal ingenuity, innovation and knowledge. Thus, diverse actors can deal with similar events differently due to their varied abilities. It is thus possible to encounter different individuals either surviving or dying within the same context as a result of their unique understanding of the events and the suitability of their responses.

Resilience at the non-individual levels is organized through collective action and response, which are dependent on social institutions that determine the actions applied and ensure compliance (through sanctions and penalties) to reduce competing individual interests. This is particularly important when dealing with a common pool of resources, such as pasture and water in pastoral societies, where exploitation is likely to be competitive and conflictual.

This paper argues that gender is a critical factor in understanding vulnerability in Bor County, Jonglei State, South Sudan, alongside geographical location, economic setting and political environment. These contextual conditions interact

with each other and with other external drivers such as market forces, urbanization, consumerism, infrastructural development and technological interventions to produce differential types and degrees of vulnerability [31]. These vulnerabilities can be addressed to enhance the resilience of communities through gender-responsive measures based on the capacities of men and women in their context. As demonstrated in [12], this requires a more nuanced analysis than is currently the case, especially by using fresh primary data.

4. Theoretical Framework

The study is guided by the feminist intersectionality theory, which posits that there are mutually constitutive relations among social identities. Identity refers to “social categories in which an individual claims membership as well as the personal meaning associated with those categories” ([40], p. 301; 41). It enables a reflection of the multiplicity of factors that influence position, hence provides a framework for comprehensive analysis, identification of problems and development of holistic solutions.

The key tenets of the theory are outlined by [40]. First, gender is often the starting point of analysis because it “constructs and maintains the subordination of women as a group to men as a group across time and culture” ([40], p. 307), referring to [42]. Second, individuals or groups have multiple identities, none of which alone can satisfactorily define them. These social identities are layered and “mutually constitute, reinforce, and naturalize one another” ([40], p. 302). Each category gives meaning to another, combines with the others to fortify the position of power (or lack of it) of the individual or group and creates dynamics of self-evidence in the experiences of the subjects, making them internalize and believe that this is how life should be. Third, the intersections do not only create oppression, they also produce opportunity [43], as referred to in [40]. This captures both horizontal and vertical sites of advantage and disadvantage. For the former, certain entities enjoy privileges that others do not have access to. On the latter, there are also relatively disadvantaged groups among the advantaged, and vice versa. In which case, there is no homogeneity among either group. Fourth, the identities are fluid, morphing over time (historical) and contexts (cultures). Five, the intersection of identities consolidates into a hybrid – a meta-identity, a composite of the distinct ones [44]. This is much like ethnic or racial groups that emerge from inter-marriages, with the emerging products being neither one nor the other of the original couples. The theory helps in identifying the various identities into which the study subjects fall, the layered nature of (dis)advantage and the composite gendered impact of the reality.

The paper also relies on the Conflict and Environmental Security Theory as articulated in [45]. The theory has six analytical components. First is environmental scarcity, under which it is argued that environmental changes and resource scarcity can lead to conflicts. Second is environmental degradation, which is recognized as a factor that increases vulnerability and therefore potentiates or escalates conflict. Third

is population growth as a force that exerts pressure on available resources, hence heightening competition and laying a foundation for conflict. Fourth is migration and displacement, conceived as inevitable consequences of environmental changes. In themselves, these two can also lead to conflict as migrating populations come in contact and compete for resources with host communities. Fifth is governance and institutions, which are critical for managing resources as well as preventing and responding to conflicts. Sixth is adaptation and resilience, which focuses on the capacity to mitigate conflicts arising from environmental changes.

This theory helps in examining: the gendered impacts of climate change in Bor County; the nexus between climate change and conflict; implications of pastoralist practices for women compared to men; and differentiated measures women and men use to cope with the evolving situation, and what this suggests in terms of future strategies.

Complementing the theories is the Capacities and Vulnerabilities Framework [46], which proposes gender disaggregated identification and analysis of strengths existing in individuals or groups and correlated vulnerabilities - long-lasting conditions which reduce their ability to survive, cope and recover from adversity. This enables a discussion of women's relative to men's agencies and constraints in a context of intersecting climate change and conflicts.

5. Methodology

The study applied a mixed-methods approach with a cross-sectional design, enabling the collection of in-depth information from diverse men, women and male and female youth. It was conducted in Bor County (Figure 1) of Jonglei State in South Sudan. The county has six (6) *Payams* (lowest administrative units), namely Makuach, Anyidi, Baidit, Kolnyang, Jalle and Bor Town. Bor County occupies about 120,000 km², characterized by plains and clay soils, prone to flooding.

A typical year in Bor County has the following four seasons: January to March (dry, hot, clear skies and temperatures of 40°C to 45°C); April to June (heavy rains, light cloud cover, heavy westerly winds and temperatures of 36°C to 39°C); July to September (heavy rains, flooded and muddy lands that are often impassable, high humidity and temperatures of 30°C to 35°C); and October to December (light rains, clearer skies and temperatures of 20°C to 30°C).

The target population consisted of women, men, and male and female youth drawn from the six *Payams*. Respondents were identified through multi-stage sampling with 6 stages, starting from the *payam* down to *bomas* (wards), villages and eventually households and individual men and women.

Stage 1 involved the selection of *payams*, five from a total of six. This was based on physical access as the sixth *payam* was flooded and unreachable. All selected *payams* had a mixture of pastoralists, crop farmers and fishing households with each category being included in the sample. In Stage 2, the researchers selected 50% of the *bomas* in each *payam* followed by Stage 3 on the selection of villages through cluster sampling. In Stage 4, the original idea was to use simple random

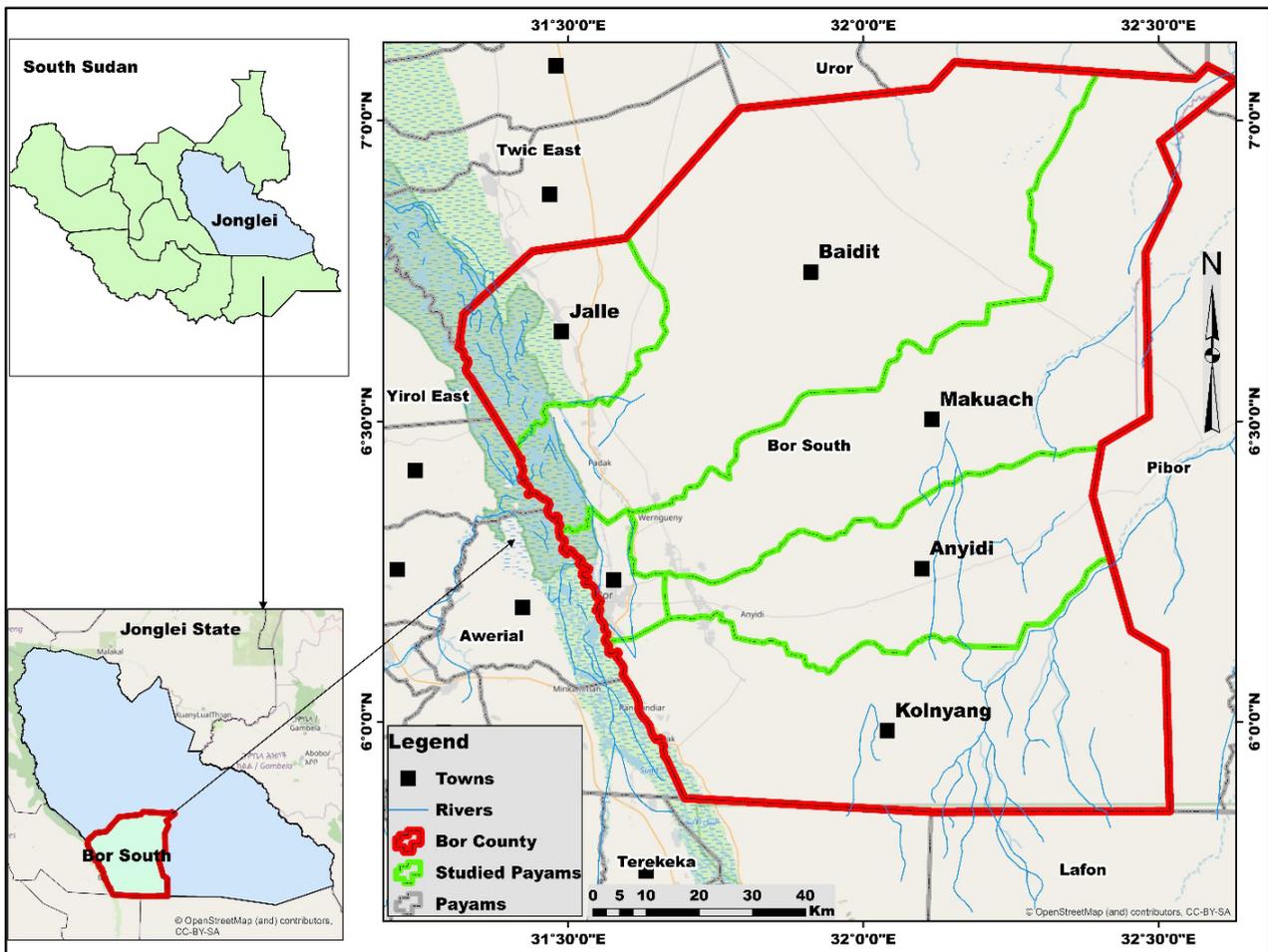


Figure 1. Bor County, Jonglei State, South Sudan (Source: [17]).

sampling to select 30% of households from each *boma*. In reality, the desired spread of *bomas* was not achievable because of logistical, weather and security concerns. The team therefore used purposive, convenience and snowballing sampling, ensuring that all five *payams* were covered. The main consideration then was to achieve the intended sample size of 600 respondents, which was calculated based on an estimated *payam* population of 30,000. Once in a household, the researchers selected members aged 18 years and above. Stage 5 involved ensuring that the sample was gender representative - covered men, women and female and male youth for the household survey. Gender balance was ensured by alternately interviewing men and women in sampled households.

Stage 6 focused on purposive sampling of the 40 key informants, which was based on the positions and roles they played within the study area and in consultation with the local field contacts. The informants were community leaders, religious authorities and administrators. Considering that most of them were male, the team modified the inclusion criteria to enable women to be included in the sample. In this regard, it redefined leadership to include women who were informative and engaged in advisory capacities at the community level, e.g. birth

attendants.

The study covered 608 household survey respondents and 40 key informants. Convenience and snowballing sampling were used bearing in mind the prevailing weather conditions, time pressure and transport logistics hence focus was on accessible areas.

Secondary data was gathered through document review, while primary data was collected using key informant interview schedules, focus group discussion (FGD) guides and a household survey questionnaire. The qualitative primary data were transcribed and translated from the local language (Dinka) to English. Coding of the qualitative data was done in the document browser of NVivo software Version 7 using the Coder. Coding involved the desegregation of textual data into segments, examining the data similarities and differences, and grouping conceptually similar data in the respective nodes. A project statistician then used the coded responses to extract necessary themes. This was followed by thematic analysis, narration and interpretation of findings to draw references and make conclusions.

Research tools were developed in consultation with SPARC project staff for quality assurance. The enumerators were trained, and the tools piloted and revised. Ethical approvals were obtained from the National Commission for Research of South Sudan and Kenyatta University's Ethics and Review Committee (PKU/2578/I1704), which is accredited by the National Commission for Science, Technology and Innovation-Kenya [18] All team members had necessary vaccination certificates and were enrolled in a security alert system that provided regular updates and informed the national and local intelligence services on all planned field activities. Local administrators in Bor County were also apprised. The informed consent of respondents was taken verbally, and assurance of confidentiality was given. Interviews and discussions were held in places away from physical distractions and threats. The anticipated limitation of the language barrier was managed by engaging enumerators drawn from Bor and fluent in the local language.

Since this study was conducted in a specific location and for a defined project, its findings and recommendations are limited to Bor County of South Sudan. They may not, therefore, be generalizable to other regions or communities in South Sudan or elsewhere. Being a cross-sectional study conducted over a short period of time in which there were limited interactions with the communities of Bor County, it does not benefit from insights that would have been gained from a longer ethnographic engagement. Finally, gender relations are fluid and manifest differently at various times and even locations within the same region. These nuances require multiple and repeated studies to capture for comparison and generalization, which is not possible with a cross-sectional study such as this one. However, secondary data was relied on to fortify and corroborate the findings.

The study findings are presented and discussed in the next section.

6. Study Findings

This section presents and discusses study findings on the gendered vulnerabilities

in the context of climate change in Bor County, Jonglei State, South Sudan. The vulnerabilities are identified and analysed thematically.

Livelihoods

As of August 2018, the 12 livelihood zones of South Sudan were categorized as agrarian, pastoralist or agro-pastoralist. The main sources of livelihood in Bor County are pastoralism, crop farming and fishing, supported by key resources, namely livestock, land and water expanses.

According to study respondents, rural land is owned communally, and individuals can settle at any place of their choice as long as it is within the boundaries of the community and permission is granted by the sultan/chief. In peri-urban settlements, individuals choose where to settle. Ownership of land is conferred by: a title issued by the Ministry of Housing (in urban areas); an allotment letter from a municipal or county authority; and/or a sale agreement. Notably, these documents only bear the names of men, based on the fact that they are the heads of families, a status conferred by tradition. Women cannot sell land as its ownership is vested in men at the household and community levels. An FGD for the youth was categorical that women only have usufruct rights by their marriage, and are subject to the authority of their husbands. As stated in a women's FGD, "Women can be given land theoretically, but they do not own it". Women also cede family property when they divorce or when widowed [47].

That women have only access and user rights to their husbands' or fathers' resources limits their ability to apply the same in climate adaptation [3]. This limitation is a big source of gendered vulnerability as it renders women dependent on and captive to men's decisions. It also deprives them of an independent economic foundation upon which to chart their trajectories. As reflected in the Conflict and Environmental Security Theory, this is a governance issue, determined by the sociocultural norms, but one which creates obvious adaptive vulnerabilities for women.

In this case, the skew in ownership of and decision-making over resources is dictated by cultural norms which automatically marginalize women. According to a male KI, "women decide on the small-scale matters and men on the large-scale matters". Hidden in this is a judgmental attitude that treats women's domains of influence as inferior, hence negating the concept of complementarity of roles. The marginalization is encoded in a folk saying that "women play with resources like chicken" and thus should not be entrusted with their management.

Using the feminist intersectionality lens, the foregoing findings reveal layers of gender-based disadvantage related to ownership of land, economic dependence, decision-making powers, status defined by proximity to a man (father or husband) and subjectivity to cultural norms.

It is noteworthy that while ownership of land is a big capacity for men, it can also be a source of their vulnerability. For instance, should the land be flooded or degraded, its significance as an economic asset diminishes instantly, and the power and status it bestows are eroded. Such an eventuality has a compound effect

on both women and men, the former of whom depend on the assets for their gender roles.

In crop farming, men and women of Bor County cultivate together, but the latter thereafter harvest, process and store the produce, managing it once at home (Various FGDs). However, they must report deficits to their husbands, who then work out how to replenish the stock (FGD, elderly men, Bor, 25th November 2023). Under livestock, women specialize in processing milk into various products such as fermented beverages, ghee and local cheese. In fishing households, women process landed fish and preserve it by salting, sun-drying, smoking and frying. These roles contribute to food security, especially during times of drought and floods when economic activity is minimal and productivity is depressed.

In the context of livelihoods in Bor County, flooding is both a curse and a blessing. While it displaces people and destroys shelters and other infrastructure, it also results in bountiful fish yields, which have transformed fishing from a subsistence to a lucrative commercial activity with traders selling in neighbouring countries such as Uganda and the Democratic Republic of Congo (DRC). In the view of youths in an FGD, this industry alone can sustain Jonglei State economically. According to their estimate, one 40-foot container fetches as much as USD 40,000 in the DRC. The transformation of the fishing industry creates an opportunity to elevate women's indigenous knowledge in the processing of the produce (e.g. gutting, cleaning and preservation through salting, smoking, and sun drying) to a commercial venture.

Notably, however, this international trade is dominated by men who are the primary beneficiaries of the income and associated benefits, such as exposure to new markets and cultures, technology and social experiences which boost their capacities to cope with adversity as it opens up alternative livelihoods (Women's FGD, Kolnyang, Bor, November 2023). That women are marginal in such trade implies an automatic economic disadvantage on their part. There is no tangible evidence that they gain from a trickle-down effect. And even if they did, they are not direct beneficiaries of actual engagement in the trade.

According to study respondents, the business is becoming a source of domestic strife, from the fact that the male traders hardly disclose to their wives the profits they have spent. This is a gender power relations issue in which men feel entitled to the proceeds of commerce and feel that they are not accountable to their wives, yet the latter are direct stakeholders in the value chain, both as citizens and actors in processing the fish for trade. The indifference to the women's interests ignores the opportunity cost they incur when they remain to manage homes and supervise men's traditional responsibilities when the latter travel for trade. Another potential problem associated with export trade is men's exposure to sexually transmitted infections, with obvious implications for their wives.

This pattern clearly shows how exploitation of a common economic resource can affect women and men differently. On the one hand, fishing has opened up new economic opportunities for the whole community. However, it mainly benefits men

with women being marginalized from the export trade, its income and the tangential benefits it entails. Instead, the trade is complicating their marriages, increasing their workload and leaving them economically uncompensated for the efforts in supporting the value chain. From a theoretical perspective, it has catapulted men's capacities but depressed women's and heightened their vulnerabilities.

Comparisons with Kenya show that such gender power relations are common in regions that produce tea. Typically, men are the default recipients and decision makers over the proceeds from the crop despite women's significant contribution of labour in the value chain [48]. One solution that has been applied in Kenya is for cooperatives to allocate a certain percentage of the proceeds to women so they are not left destitute and uncompensated. Perhaps this is a model that can be adopted in Bor to ensure equity in the distribution of the business among women and men.

From a capacities and vulnerabilities perspective, the fish trade has catapulted men's capacities but depressed women's and heightened their vulnerabilities. In line with feminist intersectionality theory, the situation confirms the entanglement of opportunity and oppression. Specifically, fishing as a commercial venture has economic promise for women (opportunity) but embeds negatives such as their continued domestication, potential for domestic violence and exposure to disease and little reward for their inputs in the value chain (oppression).

Another dimension of flooding as a curse that aggravates gendered vulnerabilities regards gender roles and crop farming as an alternative source of livelihood. According to [49], floods destroy the assets women rely on, such as cultivable land, thatching grass and wild fruits. This exacerbates women's vulnerabilities by interfering with their abilities to provide food for families and secure building materials, roles in which they also act as repositories of knowledge on natural resource management [50], which is instrumental in coping with climate change.

Women's roles also include domestic chores (cooking, washing, fetching water and firewood, cleaning, care work and tending small ruminants such as goats and sheep) (Elderly woman, Bor, 25th November 2023). These roles are carried out manually and concurrently [51] [52], making them physically and emotionally demanding. Since they are performed in the private and domestic sphere, women's scope to engage in public affairs, receive formal education and invest in personal growth and development is curtailed [53]. The responsibility for collecting natural resources like firewood and water exposes them to risks, such as sexual violence [3]. Since rain is the main source of water in communities and camps for internally displaced persons, this implies that women have to walk long distances to fetch the commodity during drought [54]. Men's roles include: construction of family shelter; providing security for the family, livestock and the community; and tending livestock. The last straddles free range grazing, search for water and salt licks, health care, slaughter and sale. Men also look for work in towns to earn for their families and make decisions on migration.

Various gendered vulnerabilities to climate change effects are embedded in

these roles. First, floods destroy the family shelters, hence creating pressure on men to construct new ones, which are themselves vulnerable to destruction, making this a vicious cycle of response. In extreme cases, the men have to decide whether to stay or migrate, with the former implying constant surveillance and the latter requiring resources for movement and survival during the journey, all to be mobilized by the men. Second, in either flooding or drought, the pastures are decimated, exposing the livestock to hunger and disease, resulting in loss of value or even death. As the primary caretakers of livestock, men are under pressure to look for alternative pasture, or face the reality of losing their livestock and with this, their livelihoods and stature. These findings revolve around the concept of scarcity, under which the conflict and environmental security theory argues that environmental changes and resource shortage can lead to conflict.

Livestock is a significant aspect of wealth and status in Dinka culture. It is crucial for resilience and contributes to daily sustenance in terms of food, income and accumulation of wealth [55]. The [56] estimates that South Sudan had the highest per capita livestock holdings in Africa with populations of 12 million cattle, 25 million goats and 20 million sheep. A big proportion of this population certainly resides in Bor County given that the Dinka is a major cattle-keeping community.

The ownership of and control over livestock is in the hands of men, denoting economic imbalance. Women cannot sell or even slaughter the livestock. However, exceptions exist, as evident in revelations by an elderly woman that in her youth, she traded in cattle. However, she brought the income home to her husband, who then made decisions on how it was spent (KII, 25 November 2023, Bor). A related revelation was that women's ability to own cattle increases with age. An elderly woman declared that if she had the means to acquire cattle, she would do so without any hindrance, unlike a younger one who would not. Unfortunately, this was just a wish that she did not actualize due to economic incapacity, perhaps a reflection of the limitations other women face as well. But even if she were able to acquire the cattle, she would still entrust a young man from her family (e.g. grandson) to care for them. This suggests a gendered pattern in which livestock and their management remain masculine, the owner notwithstanding.

The two examples point to age as a key determinant of what women can or cannot do. In the first example, youth is associated with venturing into a physically demanding traditional male domain. Second, old age is an enabler. This variable requires further investigation to determine whether and how it can be leveraged to erase or minimize gender disparities and break barriers to women's participation in economic activities.

The examples also confirm that contrary to the impression that livestock-related activities are rigidly segmented, there are circumstances under which women execute what is ordinarily men's responsibilities. This indicates that the culture may not, after all, be inflexible, which suggests that such opportunities for breaking gender barriers can be identified and capitalized on to address gender imbalances and associated vulnerabilities.

One major livestock product women have control over is milk, which they buy and sell as itinerant traders across the country's regions (Youth FGD). It thus provides an anchor around which to build their economic agency and empowerment. The potential is demonstrated by the example of a new milk pasteurization and preservation centre managed by Jobwong Nhialic Women's Group in Bor town [57]. The opportunity was identified from the observation that women sold raw milk under unhygienic conditions along urban roads and in the local market. The transformative potential of this venture was captured as follows by the Jonglei State deputy governor during the launch of the centre:

It may look small at this stage, but this is the beginning of industrialization of our milk production. We need to realize the actual financial value of our cattle away from their traditional use for marriage, pride and cultural activities

This statement scopes the potential of milk as a resource towards economic empowerment. Since milk is in women's traditional domain, it is critical to ensure that once the commodity is commercialized, its ownership and control by women is safeguarded so that it benefits them the most. An example from Kenya is the camel milk value chain in Isiolo County, which is a main occupation for women's groups that supply the produce to the country's capital city Nairobi, where demand is very high (See Anolei Camel Milk Cooperative: a powerful story of women!)

(<https://www.sparc-knowledge.org/innovations/anolei-women-camel-milk-co-operative>).

Pastoralists in Bor County constantly migrate with their livestock in search of pasture and water, hence are subject to changes in transhumance mobility patterns due to climate change [58]. It is men who decide whether and when to migrate with the whole family when the situation demands so. The responsibilities conferred upon men various layers of expectations, including decision-making and execution about when to move, where to and how.

The time to move must consider the seriousness of the situation so that it is not too late, and the journey can be supported by available resources. Where to go requires networking for information on habitable places as well as the likely hospitality of anticipated hosts. How to move concerns the mode of transport, its adequacy and speed. All these have to primarily depend on the physical, social and attitudinal capacities of the men as heads of households.

The uncertainty of how long the family will stay in "exile" is itself a source of worry. The men also have to deal with the resources to carry along, those to dispose of or abandon, provisions for the journey and safety and security. They additionally have to prepare for the risks along the migratory routes. Women, on the other hand, have to think about their gender roles within the context of migration.

The exploration of migratory adaptation options and competition for water and pasture inevitably brings communities into conflict with others, exposing men to risks of injury and even death, and denuding women and children of their

protection and roles of providing for the family.

As owners of livestock, men are impoverished when their animals are decimated by drought and floods, wiping out their capacity to provide for families and diminishing their social, economic and political status. The coping measures they adopt include conflict and unsustainable use of natural resources, with obvious implications for climate change. Large-scale transhumance leads to the destruction of the ecosystem, occasioning scarcity of natural resources and creating social tension and conflicts [59] over access to water points and grazing zones as a result of climate change [6] [60].

The young men engaged in cattle rearing miss out on formal education as their fathers, who are large-scale livestock keepers, retain them as workforce. Even after getting their own families, such individuals do not see the need for education for their children. To them, owning cattle is the ultimate achievement, and education is inconsequential. This is an obvious source of vulnerability for young men as it excludes them from the benefits of modernization. The situation suggests the need to look at ways of modernizing pastoralism so that it does not entirely depend on the labour of sons. In addition, models that can enable the livelihood to co-exist with formal education can be explored.

As captured in the Conflict and Environmental Security Theory, environmental scarcity stimulates conflict, while environmental degradation increases vulnerability and therefore competition, which inevitably also results in conflict. Migration and displacement in themselves can also lead to conflict as those on the move come into contact and compete for resources with host communities. The various identities of men as providers, protectors, decision makers, owners of resources, planners and cattle raiders demonstrate an intersectionality of roles that confer status but also come with risks.

The livestock economy in Bor demonstrates the inextricable linkage between capacities and vulnerabilities. On the one hand, livestock are a major asset during times of normalcy in sustaining subsistence and as a store of wealth and a source of social status. The reverse is the case during droughts, floods and raids when they become a source of stress for men, a threat to their economic base and a trigger of violence and insecurity.

But pastoralism keeps on evolving. Thus, pastoralists develop strategies to adapt to reshape the interplay between livestock and crop production [61]. In Bor County, agro-pastoralism is increasingly becoming a coping mechanism for subsistence due to climate change. However, the livelihood is negatively affected by flooding which is associated with the rising of Nile waters [1] that consequently destroys crops and discourages crop farming.

Floods have become more common. They have discouraged people from farming. Since 2017, floods have been experienced twice a year. In April this year (2023), they were quite severe. They were also experienced around September/October 2023 (KII, Bor, November 2023).

Frequent flooding makes crop farming a fragile and unreliable livelihood that can easily fail and result in widespread food insecurity and attendant malnutrition, with adverse effects on especially children and women, who remain in the private space and are often washed away, their shelters destroyed and many times amenities they depend are dilapidated. It is therefore imperative to consider how to make crop farming dependable.

6.1. Marital Practices

In Bor County, marriage is contracted by men paying bride-wealth, in the form of cattle, to the bride's family. The more cattle paid, the higher the social value of the bride and the more prestigious it is for the groom [53] [62]. This practice makes women consider bride wealth a critical and mandatory practice, thus, they are ardent supporters of the practice. Yet this practice puts pressure on young men to raise the hefty number of livestock required, leading them into recurrent cattle raiding with its attendant risks of injury and death. This aligns with the theoretical tenet of scarcity as a stimulant of conflict. The young men are further motivated to secure virgins as brides because such girls are considered more honourable. But their bride wealth is much higher. That payment of bride-wealth is strictly a transaction between men, yet women demonstrate the commodification of girls. The cultural practice chains women to marriage and limits their escape from violent relationships. This is because the livestock paid is distributed among a wide array of kin, who are unwilling to repay it on the breakdown of marriage. Moreover, the livestock may have died, been sold or have been slaughtered or taken away by raiders. Consequently, women have developed a high tolerance threshold for abusive marriages [62].

Child marriage is also common and culturally permitted [51] [52] [63] [64]. It is largely informed by the high premium placed on girls as a source of wealth (livestock) and men's property. From the study, the majority of women (52.24%) and men (42.04%) strongly agreed that girls are a source of wealth.

That about 52 percent of girls get married before reaching the age of 18 is partly fueled by the cultural definition of adulthood, which does not align with chronological age [48]. Among many South Sudanese communities, the Dinka included, a girl is considered mature and ready for marriage upon the onset of menses [64]. Polygamy is also widespread in Bor County. Wealthy men have total liberty to marry as many wives as they wish, tending to prefer young girls. Men who have lost huge numbers of livestock to drought, floods and conflict have become paupers [60] with reduced capacity to fulfil their gender roles. Such men have adopted bride wealth as a coping mechanism and hence are ready to let their daughters into child marriage [53] [64], directly contributing to the non-enrolment of girls in school or their withdrawal and dropout, eventually resulting in high illiteracy among women [49]. This again illustrates how scarcity due to environmental changes can lead to gendered vulnerabilities.

From an intersectionality theory perspective, these findings illustrate that even

among men (who are advantaged relative to women), there are disadvantaged ones. With specific reference to marriage, men who are less endowed with livestock are less advantaged in the marital market compared to those with huge herds in a context where nuptial unions are cemented by payment of animals, and the number determines the status of both the bride and groom. This conforms with the intersectional theoretical perspective on the lack of homogeneity among both advantaged and disadvantaged groups. As illustrated in the paradox of cattle raids as both a source of livestock but also one of injury and death, the implied masculinity is double-edged, conferring power and privilege but also embedding serious risks.

On a positive note, however, communities are increasingly recognizing the value of girls' education. To the statement that "girls do not need education because they will be married". 25.62% of male and 14.45% of female respondents disagreed, signaling support for girls' education and arguing that education enhances a girl's social value.

If (a girl is) educated before marriage, the income in the family is enhanced. After marriage, the husband compensates by paying more bride wealth. (Men's FGD, Bor; November, 2023).

An educated girl will get married, so she brings cows but also takes care of her parents throughout life (In-depth interview, elderly woman, Kolnyang Payam, Bor, November 25, 2023).

The above statements demonstrate a cross-gender consensus that girls' education is valuable because it improves the families' standards of living by, for instance, the girl erecting modern houses for parents, financing the education of siblings, accessing modern medical care for family, improving family nutrition and expanding the father's herds through the purchase of more livestock [65]. Notably, this is tantamount to instrumentalising the girls as the benefits of education are considered important primarily for the family rather than for themselves. Such a perception conforms with the commodification of girls. Nevertheless, the positive attitude can be leveraged to advocate and expand girls' education.

6.2. Motherhood

The more children a man has, the higher his social status, because this confers on him and his clan demographic dominance over others, indicates a higher responsibility capacity and earns him respect. Women have no say in the number of children to bear and primarily gain acceptance into the family through fertility [66]. Since bearing children perpetuates the patrilineal clans, an infertile woman is a disgrace and a liability [64]. Motherhood certainly requires relevant sexual and reproductive health facilities. In Bor, thanks to flooding, the few health facilities are often completely washed away, leaving expectant mothers with no services, as captured below.

The 2021 floods washed away the local health facility and I was not able to go

for my prenatal clinic. I missed my check-ups as there was no doctor to attend to me. That explains why you see my son with yellow eyes. I attribute it to failure to complete my doctor's visit (Female key informant, Anyidi Payam, Bor, November 2023).

This lament demonstrates women's vulnerability to the effects of flooding and that the same has a snowball effect on their dependents. In this case, addressing the issue will have a positive ripple effect across generations and hence is worth undertaking.

6.3. Gender-Based Violence

The conflict in South Sudan and the resulting breakdown in law and order has normalized violence against women and girls, which is manifested in rape, abductions and killings [67]-[69]. In some communities, girls are used as items to compensate communities aggrieved by the killing of their kin [62], which constitutes commodification. Such girls are never consulted, indicating a power dynamic in which their interests and decisions are subordinated to those of the clan, represented by male elders.

Whereas communities treat girls as a capacity they can use to resolve conflicts, they are concurrently exploiting the gendered vulnerabilities of this group as an easy target and a ready commodity to exchange for peace. This practice forces the girls into a new environment in which there is no guarantee of their safety, which is a blatant compromise on their human rights. Thus, there is a need to rethink alternative forms of compensation that can be used instead of the girls.

Elderly men in Anyidi and Jalle *Payams* confirmed that during cattle raids, a mechanism for replenishing livestock lost during floods, droughts and famine, girls and boys are often abducted as part of military loot from battle. This normalizes this form of gender-based violence as a military strategy. While the girls are married by the abductor(s) or sold to third parties, the boys are deployed as herding labour and human shields for the captive community, showing the gendered vulnerabilities.

The raids are also characterized by sexual violence. In an FGD in Jalle *Payam*, participants noted that girls and women are subjected to sexual violence. Key informants added that wife-beating, emotional abuse and sexual harassment (touching of breasts and private parts) are widely practised during the raids. Such transgressions inevitably lead to teenage pregnancies and school dropout. Girls who have been raped are twice victimised because they are considered to have lost their honour and attractiveness to suitors. They cannot, therefore, fetch substantial bride wealth and are a liability.

Normalization of violence in conflicts replicates toleration of wife battery [52] [53] [70]. Husbands routinely beat up wives as a form of "discipline". Survey data confirmed this norm with 30% of men and 56% of women strongly agreeing that "men have a right to discipline their wives by beating them". Ironically, this shows that even the people most negatively affected by the practice support it, no doubt

due to their socialization and hence internalization of the norm. A statement by a woman's FGD that "if a man does not beat the wife, she is accused of having silenced him" defines a hierarchy in which men are expected to be dominant. Not being so is a stigma that pressures them to use violence to stamp their authority over women. This norm is intergenerational. Findings from a youth's FGD that girls face violence when they decline the advances of young men at traditional dances demonstrate a mindset of entitlement.

Women often stay in violent marriages because of economic dependence on their abusers even when such compromises their safety, health, well—and personal agency [71]. Multiple FGDs for both sexes revealed that a family where domestic violence is common has a tainted public image. This presents a paradox – that violence is stigmatized yet highly tolerated - exposing the inherent contradictions in the community's value system.

Women's vulnerability is worsened by the fact that local mechanisms for addressing domestic violence hardly ever favour them [70].

If a woman does something wrong to a man, elders will take up the issue with the in-laws, who will apologize, and the woman will compensate with a heifer. If a man is wrong, the elders will let him off with counselling and a warning (Elderly Woman, Kolnyang).

This disparity in terms of accountability betrays a system which is gender biased, evident in the fact that customary courts consider wife-beating acceptable if there was "a reason" behind it [70]. Knowing this loophole, perpetrators can always invent a reason to justify their actions.

Such complicity also exists in rape. The cases are dealt with in family circles and often settled through compensation, given to the father of the affected girl or the husband of the concerned woman [62]. The survivor is left to suffer the physical, psychological and sexual trauma empty-handed. In this scheme, harm is perceived to have been perpetrated on the father/husband and not the daughter or wife. Many raped girls are also compelled to wed the perpetrators [51], an inverted logic which exposes them to further violation and rewards the perpetrators.

Looked at from the intersectionality theoretical perspective, the lack of remedies for violence against women illustrates the disadvantage they face due to the traditional legal status as defined by culture. This is what [72] classifies as a structural element of intersectionality, where individuals or groups are marginalized by legal status or social needs.

The findings demonstrate the tenet regarding mutuality, reinforcement and naturalization of intersectionality in the facts that: women and girls have internalized and accepted the gender norms and therefore do not question them; domestic violence is highly tolerated because of the trap of bride-wealth; violence is itself a control mechanism through which men exercise their dominance over women; and the status of dependence is reinforced by women not owning property hence being vulnerable in the absence of men.

What then are the conclusions and recommendations from this study?

7. Conclusions

The first objective of this paper was to identify the gender-differentiated effects of conflict and climate change on the inhabitants of Bor County, Jonglei State of South Sudan. The paper demonstrates that gender is a critical factor in understanding vulnerability in Bor County. By gender division of labour, men and women specialize on different tasks, which constitute gendered capacities. However, these roles are also sources of vulnerability during times of stress occasioned by climate change and conflict.

The effects of climate change and conflict have certainly driven communities in Bor County to diversify their livelihood sources. This enables communities to cope but also generates new gendered vulnerabilities, as shown by the commercialization of the fish industry beyond the borders. The adoption of coping mechanisms such as charcoal burning lead to deforestation, which in the long run depletes the resources women and men rely on to carry out their gender roles. Likewise, loss of vegetative cover complicates the ability of men to rear livestock, resulting in recurrent conflict with other communities in competition for resources. Other vulnerabilities faced by men relate to exposure to risks of injury and death from cattle raids and pressure to manage and provide for families during migration.

At the centre of these gendered vulnerabilities is adherence to cultural practices and norms that have been relied on for ages. The gendered hierarchy that assigns men superiority and precedence over women is largely responsible for the marginalization of the latter from resources that are integral to climate resilience. Marital practices such as payment of bride wealth, child marriages and polygamy all work in consort to entrench the subordinate position of women and girls, resulting in limited opportunities for education and self-development, and perpetually exposing them to gender-based violence.

Payment of bride wealth itself creates a gendered vulnerability for men as it pressures them to generate livestock towards the practice, hence justifying and perpetuating cattle raids. This nexus is further demonstrated in the fact that older men who lose livestock due to climate change and conflict resort to child marriages to reboot their economies, in effect perpetuating non-enrolment or dropout of girls from school, with lifelong implications on the realization of their full potential.

While conventional wisdom may portray that the local culture is rigid about women's activities and status, the study cites examples where exceptions exist. This demonstrates that there are opportunities that can be leveraged within the cultural system to enable the crossover of women into the perceived men's domain. This suggests the existence of opportunities for breaking gender barriers. And the transformation of the fishing industry into an export commercial venture creates an opportunity to elevate women's indigenous knowledge in the processing

of the produce.

This finding is consonant with the feminist intersectionality theory, which recognizes the fluidity of identities. In the Bor case, for instance, new experiences such as formal education and commercialization of traditional livelihoods, such as fishing, are creating new escape routes for women and girls and opening up new vistas for economic and social empowerment. The very fact that women who have crossed over into male domains are accepted illustrates this fluidity.

The study captures the layered nature of advantages and disadvantages faced by women and men. The multiple identities of women consist of: sex (biological identity); roles as domestic workers and managers; subjectivity to men as dependents and property; expectations as brides and wives; and roles as biological reproducers to strengthen lineages demographically.

For men, the multiple identities of advantage consist of sex, economic power and leadership and decision making authority. These identities confer privilege on them in terms of power at household and community levels. The men have internalized this norm of superiority and therefore expect obeisance by women as a matter of course. These layers and identities inform the study's recommendations.

8. Recommendations

In line with the second objective of the study, which was to propose gender-responsive adaptation measures in the context of climate change and conflict in Bor County, Jonglei State of South Sudan, the paper makes the following recommendations. In the context of gender division of labour, climate actions can and should recognize and exploit the specialization of men and women in resilience measures. For instance, the traditional fish processing and preservation techniques honed by women can be built into and modernized for enhanced food security and commerce. Moreover, humanitarian agencies need to include and consult women on food security measures that are relevant to the local contexts based on their knowledge of biodiversity, weather patterns, drought-resistant seed varieties and alternative foods when conventional ones are not available. In a similar vein, the indigenous knowledge of both men and women on early warning systems should be taken advantage of to plan mitigation and resilience measures.

Even as communities diversify their sources of livelihoods, it is important to keep note of the gendered vulnerabilities that come with this and take measures to manage them so they do not introduce new or perpetuate old imbalances. For instance, industry players such as cooperatives should put in place measures that ensure that women equitably benefit from the export fish trade just like men. The key opportunity for women's economic empowerment should be capitalized on. The paper illustrates that milk is a female domain and that a processing plant has been established in Bor. The government and development actors have a responsibility to women to create the necessary policy and regulatory environment to have the industry developed and with women at the centre, so that it becomes a fulcrum around which to transform their socio-economic status.

Transformation of cultural norms and practices is a complex matter that requires a multi-faceted approach and skillful navigation over time for change to be realized. Yet such change must be forged. This requires development actors, government and community leaders to initiate community conversations on the evolution of culture towards greater gender equality. These conversations must present gender equality not as a conflict between men and women but as a quest for enhanced complementarity towards a common goal of community development. The conversations should act as sensitization forums on the effects of popular cultural practices, such as payment of bride wealth, so they are not romanticized at the expense of child rights, education, among others.

This will require a new look at pastoralism as an economic enterprise with high potential. To sustain the supply of milk to such a plant will require new livestock husbandry practices with regard to transhumance, pooling and transportation of milk, development of cooperative societies and distribution and marketing networks. All this will require the development of gender mainstreaming strategies to ensure that both men and women benefit from the industry based on their placement in the value chain.

The recurrence of flooding and droughts are drivers of the vulnerability for both men and women. But they can also be seen as opportunities to strengthen resilience. This calls for long-term planning on how to make flooding a dividend by, for instance, developing large-scale water storage and irrigation systems as well as purification of the commodity for commerce.

To make crop farming dependable, seasonal planning must be started to ensure that crops mature before the floods. It also implies looking for seeds that produce fast-maturing crops. The long-term strategy would be the harvesting of flood waters for later use in irrigation.

Traditional coping mechanisms that can be leveraged to reduce transhumance and thereby conflict are: setting aside pasture banks during periods of abundance for use during lean periods; controlled mobility characterized by intermittent periods of settlement along the journey; pasture access points; and construction of communal wells. For further research, age as a key determinant of what women can or cannot do about livestock is a prime candidate. Likewise, there are research opportunities within the cultural system to break gender barriers and allow women into hitherto male-dominated spheres of work and influence.

Conflicts of Interest

The authors declare no conflicts of interest.

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