

The nexus between climate change and violent extremism in North-Western Kenya: Unpacking the nexus in a fragile dryland ecosystem

Reuben Ating'a Akeng'a Bernster

atingareuben@gmail.com

Parliament of Kenya

<https://doi.org/10.51867/ajernet.7.4.80>

ABSTRACT

North-western Kenya (Turkana, West Pokot, Elgeyo-Marakwet and Baringo counties) experiences recurrent climatic shocks and a growing presence of violent extremism, yet the pathways linking the two remain poorly evidenced. Anchored in Environmental Scarcity Theory, this study examined how climate-induced livelihood shocks (drought, livestock loss and resource-based displacement) influence vulnerability to violent extremist recruitment, and how structural and governance conditions shape that relationship. A convergent parallel mixed-methods design was adopted. The target population comprised pastoral and agro-pastoral households in the four counties and key stakeholders in security, community leadership and civil society. Primary data were collected between 2021 and 2023 from 280 randomly sampled households in 14 sub-counties, 34 key informants and eight focus group discussions (purposively selected) and were complemented by climate records from the Kenya Meteorological Department and the CHIRPS satellite rainfall dataset (1990–2023) and conflict event data from the Armed Conflict Location & Event Data Project (2010–2023). Quantitative data were analysed using Pearson correlation and negative binomial regression in R (v4.3.1), and qualitative data were analysed thematically. Drought frequency was strongly and positively correlated with conflict incidence ($r = 0.74$, $p < 0.01$); after adjusting for population density, poverty and border proximity, each additional severe drought event was associated with a 12.3% rise in conflict incidents (incidence rate ratio [IRR] = 1.123, 95% CI: 1.06–1.19). Turkana recorded the highest levels of drought, conflict and extremist recruitment reports. Qualitative evidence showed that loss of herds, idleness and economic despair expose young men to recruiters' offers of pay, weapons and belonging, while governance vacuums allow non-state actors to fill unmet security and conflict-resolution needs. The study concludes that climate change acts as a 'threat multiplier' that compounds existing poverty, marginalisation and weak governance rather than as a direct cause of extremism. It recommends climate-adaptive livelihoods, conflict-sensitive early warning, stronger local governance and community-based counter-extremism programmes.

Keywords: Climate Change; Nexus; Drought; North-Western Kenya; Pastoralism; Violent Extremism

I. INTRODUCTION

The links between climate change and violent conflict have become one of the most important research and policy questions of the twenty-first century. As weather patterns become more unpredictable and pressure on natural resources intensifies, researchers and policymakers have sought to understand how environmental disruption relates to social instability, political violence and armed extremism. The Intergovernmental Panel on Climate Change (IPCC, 2022) documents how climate change compounds existing socioeconomic vulnerability, food insecurity, displacement pressure and governance weakness, conditions that can feed cycles of grievance and political violence. In security analysis, this dynamic is commonly described as a 'threat multiplier' (CNA Corporation, 2007), a framing that the United Nations Secretary-General has echoed in warning that climate change and environmental mismanagement multiply risks where coping capacity is limited and dependence on shrinking natural resources is high (Guterres, 2021). Global mean surface temperature has already risen by about 1.1°C above pre-industrial levels, and the effects are most pronounced in the low-income and climate-vulnerable regions of the Global South (IPCC, 2022).

Africa carries a disproportionate share of these risks. The continent contributes less than 4% of global greenhouse gas emissions, yet seven of the ten countries ranked most vulnerable to climate change in the ND-GAIN Index are African (University of Notre Dame Global Adaptation Initiative [ND-GAIN], 2023). Prolonged droughts, erratic rainfall, flash floods and, in coastal areas, sea-level rise converge in sub-Saharan Africa, and the Sahel, the Horn of Africa and the Great Lakes region are widely regarded as climate–conflict hotspots (Adger et al., 2014; United Nations Environment Programme [UNEP], 2009). Continental and regional institutions have begun to respond. The African Union's (2022) Climate Change and Resilient Development Strategy and Action Plan (2022–2032) treats climate adaptation and conflict prevention as an integrated agenda, and the Intergovernmental Authority on Development (IGAD) Climate Prediction and Applications Centre (ICPAC) has started adding conflict early-warning indicators to its meteorological products.

In Kenya, the climate–security nexus is most pronounced in the Arid and Semi-Arid Lands (ASALs), which account for about 89% of the country’s land area and about 36% of its population (National Drought Management Authority [NDMA], n.d.). North-western Kenya (Turkana, West Pokot, Elgeyo-Marakwet and Baringo counties) is consistently identified as one of the most conflict-affected and food-insecure sub-regions in the country. Annual rainfall across the four counties ranges from about 200 to 900 mm and has become increasingly erratic, and the area has shown a drying trend that has accelerated since the 1980s (Kenya Meteorological Department [KMD], 2023). The region has endured a succession of severe droughts, in 1984, 1991–1992, 1999–2000, 2005–2006, 2009–2011, 2016–2017 and 2021–2023, and each has been followed by intensified competition for scarce water and pasture and by increases in inter-communal violence, cattle rustling and displacement (Table 1). At the national level, Kenya’s National Climate Change Action Plan 2018–2022 identified Turkana and West Pokot as the counties most vulnerable to climate-related insecurity, where development gains are most at risk of being undermined by climate change (Republic of Kenya, 2018).

Table 1*Major drought–conflict episodes in north-western Kenya*

Period	Climate event	Security impact
1984	Catastrophic drought	Widespread livestock losses; inter-communal raiding intensifies
1999–2000	Severe drought; mass displacement	Pokot–Turkana resource conflicts escalate; arms proliferation
2009–2011	Horn of Africa drought	Al-Shabaab presence documented; youth recruitment reported
2016–2017	Failed long rains (March–May 2017)	Baringo and West Pokot banditry surge; NDMA food security alerts
2021–2023	Four consecutive failed rainy seasons	22 million food-insecure across the Horn; conflict at a decade high (ACLED)

Note. Sources: KMD (2023); Armed Conflict Location & Event Data Project [ACLED] (2023); NDMA (2023).

At the same time, the region has seen a marked rise in violent extremism. Al-Shabaab incursions from Somalia have begun to spread westward through ungoverned spaces and porous borders, while banditry, cattle rustling and inter-communal violence, already embedded in local political economies, have in some documented cases become entangled with organised violent extremist networks (Kenya School of Government [KSG], 2023; Mkutu, 2008). Proximity to Uganda, South Sudan and Ethiopia, and the historical inflow of small arms from neighbouring conflicts, add cross-border dimensions. Young men who have lost their cattle, land and economic prospects form a ready pool for recruitment by local militias and transnational jihadist groups, and the effects of drought are also strongly gendered (International Monetary Fund, 2024). Table 2 summarises the key climate-security indicators for the region.

Table 2*Key local climate–security indicators, north-western Kenya*

Indicator	Value	Source
Kenya’s land area classified as ASAL	89%	NDMA (n.d.)
Temperature rise in north-western Kenya since 1980	+1.2°C	KMD (2023)
Major droughts recorded in the region since 1984	7 episodes	KMD (2023)
Households below the food poverty line in Turkana	60%	KNBS (2021)
Rainfall deficit during recent drought episodes	30–60%	KMD (2023)

Note. KNBS = Kenya National Bureau of Statistics.

North-western Kenya is therefore one of the most climate-sensitive sub-regions in Africa. Recurrent droughts have eroded pastoral livelihoods, caused water shortages and displaced pastoral communities whose survival depends on mobile livestock husbandry (IPCC, 2022). Turkana and West Pokot, in particular, have experienced rainfall 30–60% below normal for several consecutive seasons (KMD, 2023), stretching food systems and social cohesion to breaking point. Yet, despite growing recognition of the climate–security nexus, place-specific empirical research on how climate stressors relate to violent extremist recruitment in north-western Kenya remains limited. Most studies examine climate stress and insecurity as separate phenomena, or focus on cattle rustling and pastoral conflict, without tracing the causal and structural pathways that connect climate shocks to recruitment. This is more than an academic gap: without a detailed understanding of these linkages, humanitarian, development and security responses to climate shocks in the region risk being misdirected or even counterproductive.

This study therefore set out to unpack the nexus between climate change and violent extremism in the fragile dryland ecosystem of north-western Kenya, focusing on how climate-induced livelihood shocks relate to vulnerability to violent extremist recruitment and on the structural and governance conditions that shape that relationship. The general and specific objectives, and the corresponding research questions, are set out in Section 1.1.

The study is justified on three grounds. It provides place-specific evidence from one of Kenya's most fragile dryland ecosystems, where such evidence is scarce. It combines climatic, conflict and community-level data, which allows patterns to be established and explained rather than merely asserted. And it generates findings that can inform national and county governments, security agencies, humanitarian and development actors and community organisations in designing adaptation, early-warning and counter-extremism responses that are grounded in local realities.

1.1 Research Objectives

- i. To examine how climate-induced livelihood shocks (drought, loss of livestock and resource-based displacement) influence vulnerability to violent extremist recruitment among pastoral and agro-pastoral communities in north-western Kenya; and
- ii. To analyse the structural and governance factors that shape the nexus between climate change and violent extremism in Turkana, West Pokot, Elgeyo-Marakwet and Baringo counties.

II. LITERATURE REVIEW

2.1 Theoretical Review

2.1.1 Environmental Scarcity Theory

The study is anchored in Environmental Scarcity Theory (Homer-Dixon, 1999). The theory holds that the degradation and depletion of renewable resources, rising demand for them and their unequal distribution together produce environmental scarcity. Scarcity does not lead directly to violence. It operates through intervening social effects, notably reduced agricultural output and economic decline, population displacement and migration, and the weakening of institutions and social relations. These effects in turn generate deprivation and grievance and can trigger sub-national violence, including ethnic clashes and insurgency. Two features make the theory well suited to this study. First, its emphasis on livelihood loss, displacement and institutional weakness maps directly onto the pathways expected in a dryland pastoral setting. Second, it treats the link between scarcity and violence as contingent on context, which is consistent with the 'threat multiplier' reading of climate change (CNA Corporation, 2007) rather than a deterministic one.

At the level of the individual, the study also draws on the logic of relative deprivation (Gurr, 1970). When people perceive a widening gap between the standard of living they expect and the one they can attain, the resulting grievance can make them receptive to groups that promise redress, income or belonging. For young pastoralists, whose social standing and marriageability depend on livestock, drought-induced loss of herds creates precisely such a gap. Critics caution against environmental determinism in climate–conflict research (Raleigh et al., 2014). The study takes up this caution by treating structural and governance conditions as variables to be examined rather than assuming a direct effect of climate on extremism.

2.2 Empirical Review

2.2.1 Climate-Induced Livelihood Shocks and Vulnerability to Violent Extremist Recruitment

Research on the climate–conflict relationship has grown steadily since the early 2000s. In a meta-analysis of 60 quantitative studies spanning several continents and time periods, Hsiang et al. (2013) found that each one-standard-deviation shift toward warmer or drier conditions raised the likelihood of interpersonal violence by about 4% and of intergroup conflict by about 14%. Focusing on Africa, Burke et al. (2009) projected that warming could raise armed conflict incidence by about 54% by 2030, and Burke et al. (2015) later reviewed the wider body of evidence. Case-based work points to livelihood loss as a key mechanism. Kelley et al. (2015) linked the severe Syrian drought that preceded the 2011 uprising to climate change and argued that it contributed to social unrest, and Werrell and Femia (2013) advanced a comparable argument for the Arab Spring. Table 3 summarises selected global data points.

Table 3

Selected global climate–security data points

Indicator	Value	Source
Change in interpersonal violence per 1 SD shift toward warmer or drier conditions	+4%	Hsiang et al. (2013)
Change in intergroup conflict per 1 SD shift toward warmer or drier conditions	+14%	Hsiang et al. (2013)
Projected rise in African armed conflict incidence by 2030 under projected warming	+54%	Burke et al. (2009)
Projected internal climate migrants globally by 2050 (up to)	216 million	Clement et al. (2021)
People living in highly climate-vulnerable contexts	3.3–3.6 billion	IPCC (2022)

Note. SD = standard deviation.

The evidence is nonetheless contested. Raleigh et al. (2014) warn that attributing violence to climate risks environmental determinism and overlooks political and economic drivers of conflict. Hendrix and Salehyan (2012) show that in Africa the influence of rainfall variability is most evident in smaller-scale social conflict, such as communal violence and riots, and is conditional on context. These cautions are important for this study because they shift the question from whether climate matters to how, and under what conditions, it does. African evidence is drawn largely from the Sahel and the Lake Chad Basin. Land degradation and desertification in parts of the Sahel have reduced the availability of grazing land and farmland, sharpened tensions between farmers and pastoralists, and created an environment in which Salafist-jihadist groups such as Jama'at Nusrat al-Islam wal-Muslimin (JNIM) and the Islamic State in the Greater Sahara (ISGS) recruit. Around Lake Chad, where the lake has shrunk by some 90% since the 1960s, Okpara et al. (2015) show that environmental change, vulnerability and insecurity in the basin are closely interlinked, and Okpara et al. (2016) document how lake drying has undermined the fishing and farming livelihoods on which communities relied, amid rising violence.

The Horn of Africa, the sub-region most closely connected to this study, has experienced some of the continent's most severe recent droughts. The 2021–2023 drought left more than 22 million people food-insecure across Somalia, Ethiopia and Kenya (United Nations Office for the Coordination of Humanitarian Affairs [OCHA], 2022), and the 2011 and 2022 droughts rank among the largest climate-driven humanitarian and security crises of the past decade. Table 4 presents indicative conflict and drought data for selected African hotspots. The literature on Al-Shabaab in Kenya emphasises political and social marginality and the role of the state itself in producing insecurity, and shows that heavy-handed security responses have widened the gap between affected communities and the state (Lind et al., 2017). However, this work concentrates on Kenya's Somali and Muslim populations, and it rarely examines how climate shocks in pastoral drylands relate to recruitment.

Table 4

Selected African hotspots (2018–2023): conflict events and drought-affected population

Country	Conflict events (ACLED)	Drought-affected population	Key armed actor
Somalia	1,840	7.8 million	Al-Shabaab
Mali	1,240	4.2 million	JNIM / ISGS
Nigeria	1,650	6.1 million	Boko Haram / ISWAP
Kenya	980	5.3 million	Al-Shabaab / bandits
Ethiopia	1,120	8.4 million	Various armed groups

Note. Sources: ACLED (2023); OCHA (2022); ND-GAIN (2023).

Studies in north-western Kenya itself identify specific pathways. Schilling et al. (2012) associate violent conflict in Turkana with drought years and with competition over water points and pasture, and show that raiding is closely tied to the loss and restocking of livestock. Greiner (2013) demonstrates that among the Pokot, livestock raiding has been transformed by modern weaponry and has become enmeshed in politicised claims over land, administrative boundaries and electoral support, so that livelihood motives are increasingly intertwined with political ones. Gendered effects are also reported: women and girls carry a heavier burden of fetching water during droughts, face early marriage when bride wealth cannot be raised and are at greater risk of sexual violence in displacement settings, while young men who lose cattle, the key source of social identity and marriageability, are especially vulnerable to recruiters' promises of pay, weapons and belonging (International Monetary Fund, 2024). What remains largely unexamined is whether, and how, these livelihood shocks translate into vulnerability to violent extremist recruitment.

2.2.2 Structural and Governance Factors in the Climate–Extremism Link

The second strand of literature concerns the conditions that determine whether climate stress becomes insecurity. Busby (2018), in reviewing the field of climate and security, underlines that climate hazards translate into insecurity chiefly where they meet existing social and political vulnerabilities. This is the logic of the 'threat multiplier' framing (CNA Corporation, 2007) and of Homer-Dixon's (1999) emphasis on weakened institutions as an intervening step between scarcity and violence.

In Kenya's northern drylands, the governance dimension has been documented in several ways. Mkutu (2008) shows how the weak reach of state security and the proliferation of small arms transformed pastoralist conflict in the Rift Valley into a more lethal and commercialised phenomenon. Greiner (2013) shows that boundary, land and electoral politics shape who raids whom and why. More recently, the entanglement of traditional inter-communal conflicts with non-state actors and externally connected armed networks has been reported in governance-vacuum areas of under-resourced counties (KSG, 2023). Lind et al. (2017) add that marginality and coercive state responses can deepen alienation and thereby create conditions for insurgency to spread. Policy frameworks at continental and national levels now recognise these connections (African Union, 2022; Republic of Kenya, 2018), but the extent to which structural

and governance conditions mediate the link between climate shocks and extremist recruitment at county level has received little empirical attention.

Four gaps emerge from the review. First, much of the strongest evidence is cross-national or continental and aggregated, and it says little about mechanisms in specific local settings. Second, Kenyan studies on pastoral drylands focus on cattle rustling and inter-communal conflict, while studies on Al-Shabaab focus largely on Somali and Muslim populations, so the connection between climate shocks and extremist recruitment in north-western Kenya is under-researched. Third, few studies combine climatic records, conflict event data and household and community-level evidence within one design. Fourth, the role of structural and governance conditions, and of gendered livelihood effects, in mediating the climate–extremism link remains thinly evidenced. This study addresses these gaps through a mixed-methods analysis in four north-western counties, guided by Environmental Scarcity Theory.

III. METHODOLOGY

3.1 Research Design

The study adopted a convergent parallel mixed-methods design (Creswell & Plano Clark, 2018). The quantitative and qualitative strands were collected concurrently and analysed separately, and were then merged at the interpretation stage to compare, corroborate and explain findings. The design suits the study's objectives for two reasons. Objective 1 requires measurable associations between drought exposure and conflict and recruitment indicators, while both objectives require an understanding of lived mechanisms and governance dynamics that statistics alone cannot capture. Triangulating climate and conflict data with field evidence therefore strengthens the explanatory power and credibility of the findings. Table 5 aligns the objectives with the key variables, data sources and analytical procedures.

Table 5

Alignment of research objectives, key variables, data and analysis

Objective	Key variables	Data sources	Analysis	Findings
1. Livelihood shocks and vulnerability to recruitment	Independent: climate-induced livelihood shocks (drought frequency [SPI-3], livestock loss, resource-based displacement). Dependent: vulnerability to violent extremist recruitment (recruitment reports; conflict incidence)	KMD and CHIRPS climate data; ACLED; household survey; KIIs; FGDs	Pearson correlation; negative binomial regression; thematic analysis	Section 4.1
2. Structural and governance factors	Contextual: poverty, population density, border proximity, land tenure, ethnicity, reach of state services and conflict-resolution mechanisms	Regression covariates; KIIs; FGDs	Adjusted regression; thematic analysis	Section 4.2

Note. SPI-3 = 3-month Standardised Precipitation Index; KIIs = key informant interviews; FGDs = focus group discussions.

3.2 Study Area

The study was carried out in four counties in north-western Kenya: Turkana (68,680 km²), West Pokot (9,169 km²), Elgeyo-Marakwet (3,030 km²) and Baringo (11,015 km²). Together they cover an estimated 91,894 km² and have an estimated population of about 2.7 million people, most of whom are pastoralists or agro-pastoralists (Table 6). The counties were selected because they combine high climatic exposure, pastoral and agro-pastoral livelihoods and documented insecurity. The area has a bi-modal rainfall pattern (March–May and October–December) that has become erratic. Temperatures have risen by about 1.2°C since 1980 and are likely to rise by a further 1.5–2.0°C by 2050, depending on the emissions scenario (KMD, 2023).

The region is also geopolitically significant. It borders Uganda, South Sudan and Ethiopia, which gives rise to complex cross-border dynamics affecting climate vulnerability and security. Climate-induced tension has coincided with the proliferation of small arms, partly because of the region's proximity to Al-Shabaab's operational theatre in Somalia and partly because of the historical flow of weapons from regional conflicts in South Sudan and Uganda.

Table 6

Study area characteristics by county

County	Area (km ²)	Population (est.)	Annual rainfall	Primary livelihood	HDI range
Turkana	68,680	926,000	200–500 mm	Pastoralism	0.38–0.41
West Pokot	9,169	621,000	400–750 mm	Agro-pastoralism	0.40–0.43
Elgeyo-Marakwet	3,030	454,000	600–900 mm	Mixed farming	0.42–0.46
Baringo	11,015	666,000	300–650 mm	Pastoralism	0.41–0.44

Note. HDI = Human Development Index. Sources: KNBS (2019); KMD (2023); United Nations Development Programme [UNDP] (2022).

3.3 Target Population

The target population had two components. The first comprised pastoral and agro-pastoral households in the four counties, which together have an estimated population of about 2.7 million people (Table 6). The second comprised key stakeholders with knowledge of climate stress, security and recruitment dynamics: county security officers, community elders, non-governmental organisation (NGO) practitioners, religious leaders and former militia members. The secondary climate and conflict data covered all four counties at the county-year level.

3.4 Sampling Techniques and Sample Size

Random sampling was used to select 280 households across 14 sub-counties in the four counties, to reduce selection bias and allow the household data to reflect the diversity of livelihood profiles and climate exposure in the study area. Key informants and FGD participants were selected for their knowledge of, and exposure to, the climate and security issues under study. In total, 34 key informants were interviewed and eight FGDs were held, each with 6–10 participants, organised by gender and age cohort to capture differentiated experiences of climate vulnerability and exposure to recruitment. The climate and conflict datasets were not sampled: all available county-year observations were used (Table 7).

3.5 Data Collection Instruments and Procedures

Four types of instrument and source were used. Secondary quantitative data comprised monthly rainfall anomalies, the Normalised Difference Vegetation Index (NDVI) and temperature records for 1990–2023 from the Kenya Meteorological Department and the Climate Hazards Group InfraRed Precipitation with Station data (CHIRPS) satellite dataset (Funk et al., 2015), together with incident-level data from ACLED for the four counties (2010–2023), classified by type of conflict (inter-communal violence, banditry and extremist attacks). Primary quantitative data were collected with a structured household questionnaire covering livelihood profiles, climate exposures, displacement experiences and perceptions of the presence of extremists. Primary qualitative data were collected through semi-structured interview guides for key informant interviews and discussion guides for FGDs, which explored community narratives of climate vulnerability and exposure to extremist recruitment. Extremist recruitment reports were derived from aggregated key informant data.

Table 7
Summary of Data Sources, Instruments, Samples and Periods

Component	Source or instrument	Sample or coverage	Period
Climate data	KMD records; CHIRPS satellite dataset	Four counties; monthly rainfall anomalies, NDVI, temperature	1990–2023
Conflict data	ACLED incident-level data	Four counties; by conflict type	2010–2023
Household survey	Structured questionnaire	280 households in 14 sub-counties (random sampling)	2021–2023
Key informant interviews	Semi-structured interview guide	34 informants	2021–2023
Focus group discussions	FGD guide	8 groups of 6–10 participants, by gender and age cohort	2021–2023

Note. NDVI = Normalised Difference Vegetation Index; CHIRPS = Climate Hazards Group InfraRed Precipitation with Station data.

3.6 Data Analysis

Quantitative analysis was conducted in R (v4.3.1). Drought exposure was measured using the 3-month Standardised Precipitation Index (SPI-3), with a drought event defined as an SPI-3 value below –1.0. Pearson correlation was used to test the association between drought frequency and conflict incidence at county level and in the combined county-year data set. Negative binomial regression, which is suited to over-dispersed count data, was used to model conflict incidence as a function of drought frequency, adjusting for population density, poverty rate and proximity to borders, and results are reported as incidence rate ratios (IRR) with 95% confidence intervals. Qualitative data from the key informant interviews were analysed using thematic analysis (Braun & Clarke, 2006), and FGD narratives were used to cross-reference and contextualise the emerging themes. The two strands were integrated at the interpretation stage by comparing statistical patterns with the mechanisms described by participants.

3.7 Ethical Considerations

Ethical clearance was obtained from the University of Nairobi Institutional Scientific and Ethics Review Committee (ISERC; Ref: UoN/ISERC/2021/048). All participants gave informed consent. Because some participants, including former militia members, discussed sensitive matters, anonymity was assured, identifying details were withheld and quotations are attributed only by role and location.

IV. FINDINGS & DISCUSSION

4.1 Climate-Induced Livelihood Shocks and Vulnerability to Violent Extremist Recruitment

4.1.1 Drought frequency, conflict incidence and extremist recruitment reports

Turkana County recorded the highest values on all three indicators during the study period: drought events, conflict incidents and extremist recruitment reports (Table 8). The four counties ranked identically on each indicator, with Turkana followed by West Pokot, Baringo and Elgeyo-Marakwet. In the combined county-year data set there was a statistically significant positive correlation between drought frequency and conflict incidents ($r = 0.74$, $p < 0.01$), and at county level the correlation ranged from $r = 0.63$ in Elgeyo-Marakwet to $r = 0.79$ in Turkana. After adjusting for population density, poverty rate and proximity to borders, the negative binomial regression showed that each additional severe drought event was associated with a 12.3% increase in the number of conflict incidents (IRR = 1.123, 95% CI: 1.06–1.19). Recruitment reports, which were derived from key informants, are presented descriptively and were not modelled statistically.

Table 8

Drought frequency, conflict incidents and extremist recruitment reports by county (2010–2023)

County	Drought events (SPI-3 < -1.0)	Conflict incidents (ACLED)	Recruitment reports (KIIs)	Correlation (r): drought and conflict
Turkana	18	214	47	0.79**
West Pokot	14	178	31	0.71**
Elgeyo-Marakwet	9	89	18	0.63*
Baringo	11	132	26	0.68**
Total / pooled	52	613	122	0.74**

Note. ** $p < 0.01$; * $p < 0.05$. The pooled correlation is for the combined county-year data set. Sources: KMD (2023); ACLED (2023); KII aggregated data.

4.1.2 Qualitative evidence on the recruitment pathway

Key informants repeatedly described a common sequence. Drought causes loss of herds; loss of herds erodes men's social status and income; idleness and economic despair follow among the youth; and recruiters step in with promises of pay, weapons and belonging. An elder from Turkana South sub-county summarised it in these words: 'As soon as a young man loses all of his belongings, he will have nothing to defend. It is at that time that money and promises come from the strangers.' Women in the FGDs explained that worsening droughts and scarcity of household resources expose their daughters to early marriage and their sons to recruitment. NGO practitioners observed that Al-Shabaab and other networks intensify their efforts in drought- and famine-affected communities immediately after failed rainy seasons, when economic desperation is at its height and formal jobs are unavailable.

The results are consistent with the cross-national evidence that climatic stress raises the risk of conflict (Burke et al., 2015; Hsiang et al., 2013), and with the finding that rainfall variability is associated with social conflict in Africa (Hendrix & Salehyan, 2012). They also resonate with the argument that severe drought can contribute to social unrest (Kelley et al., 2015). The county-level pattern, in which counties with more drought events also recorded more conflict incidents and more recruitment reports, and the 12.3% rise in conflict incidents for each additional severe drought, indicate that drought exposure is a meaningful correlate of the conditions in which extremist recruitment occurs.

The qualitative pathway supports the expectations of Environmental Scarcity Theory (Homer-Dixon, 1999) and of relative deprivation. Loss of livestock removes both income and the social identity and marriageability that cattle confer, opening the kind of gap between expectation and attainment that Gurr (1970) associated with receptivity to groups promising redress. The account is consistent with Schilling et al. (2012), who tie raiding in north-western Kenya to livelihood loss, and it extends that work by suggesting that the same livelihood shocks also create openings for extremist recruiters rather than only for cattle raiding. The gendered accounts from women in the FGDs mirror the differentiated burdens of drought reported by International Monetary Fund (2024).

These findings should nonetheless be interpreted with care. Because the statistical analysis is at county-year level, and because recruitment reports rest on informants' accounts that may under- or over-state the phenomenon, the results indicate association and plausible mechanisms rather than proof of individual causation. This is in line with the

caution against environmental determinism raised by Raleigh et al. (2014), and it is the reason the second objective examines the structural and governance conditions within which drought exposure acts.

4.2 Structural and Governance Aspects of the Climate–Extremism Link

The association between drought frequency and conflict incidence remained after adjusting for population density, poverty rate and proximity to borders, which suggests that it is not explained away by these structural conditions alone. Alongside the loss of livelihoods described under Objective 1, the qualitative evidence pointed to two further structural pathways. The first is displacement and the accumulation of grievance: as communities move because of drought, their contact with groups that have competing interests over diminishing resources can fuel inter-ethnic grievances, which armed groups later exploit. The second is governance vacuums: chronic under-resourcing of state services in the ASAL counties leaves communities without legitimate conflict-resolution processes, and these spaces are then occupied by non-state actors. Political economy variables, namely land tenure, ethnicity and border politics, emerged as intermediaries that give the climate–extremism pathway context-specific forms in each county.

These results validate and build on the ‘threat multiplier’ approach proposed by the CNA Corporation (2007) and elaborated by Busby (2018): climate change does not directly trigger extremism, but its multiplier effects operate across several layers of vulnerability. The three pathways identified in north-western Kenya (livelihood collapse, displacement and grievance accumulation, and governance vacuums) correspond closely to the three intervening social effects at the centre of Environmental Scarcity Theory, namely economic decline, displacement and institutional weakening (Homer-Dixon, 1999). Livelihood collapse is the initial stage, in which the destruction of pastoral assets, the main source of livelihood and identity, becomes an economic trigger that extremist groups exploit through material incentives.

The governance finding aligns with earlier work on the Rift Valley drylands, which links weak state reach and the spread of small arms to more lethal pastoralist conflict (Mkutu, 2008) and reports the entanglement of traditional conflicts with external armed networks in under-resourced counties (KSG, 2023). It also accords with Lind et al. (2017), whose analysis of marginality and coercive state responses suggests that security-led responses alone are unlikely to fill the vacuums identified here. The importance of land tenure, ethnicity and border politics is consistent with Greiner’s (2013) demonstration that boundary, land and electoral politics shape raiding in northern Kenya, and it supports the observation that political economy variables give the pathway its context-specific character.

4.3 Relationships among the Key Variables

Taken together, the findings show a consistent chain. Climate-induced livelihood shocks, measured through drought frequency and expressed as loss of herds, displacement and economic despair, are associated with higher conflict incidence and with greater vulnerability to extremist recruitment. The strength and form of that relationship are conditioned by structural and governance context, in particular the reach of state services and legitimate conflict-resolution mechanisms and the political economy of land, ethnicity and borders. Table 9 sets out how the objectives, findings, conclusions and recommendations are aligned.

Table 9

Consistency among objectives, findings, conclusions and recommendations

Objective	Key findings	Conclusion	Recommendation
1. Livelihood shocks and recruitment vulnerability	Drought frequency positively correlated with conflict ($r = 0.74$); each severe drought linked to a 12.3% rise in conflict incidents; Turkana highest on all indicators; herd loss, idleness and despair precede recruitment	Climate-induced livelihood shocks heighten vulnerability to extremist recruitment, especially among young men who lose livestock	Climate-adaptive livelihoods; conflict-sensitive early warning; youth livelihood and women’s economic empowerment programmes
2. Structural and governance factors	Association persists after adjusting for poverty, density and border proximity; displacement-grievance and governance-vacuum pathways; land, ethnicity and border politics mediate	Climate change acts as a threat multiplier where poverty, marginalisation and weak governance already exist	Strengthen local governance and conflict resolution; community-based counter-extremism beyond hard security responses

V. CONCLUSION & RECOMMENDATIONS

5.1 Conclusion

Climate change does not, by itself, make north-western Kenya insecure. Rather, it acts as a facilitator of the conditions in which violent extremism becomes possible, and that role is already evident in the region. With respect to

the first objective, the study found a statistically significant association between drought frequency and conflict incidence, a 12.3% rise in conflict incidents for each additional severe drought event, and consistent evidence from key informants and focus groups that loss of herds, idleness and economic despair expose young men to recruiters' offers of pay, weapons and belonging. Turkana, the county with the most drought events and conflict incidents, also recorded the most extremist recruitment reports. With respect to the second objective, the association persisted after accounting for poverty, population density and border proximity, and the qualitative evidence showed that displacement, accumulated grievance and governance vacuums, shaped by land tenure, ethnicity and border politics, provide the structural setting in which livelihood shocks are converted into vulnerability to recruitment. The study therefore supports the 'threat multiplier' reading of climate change and the expectations of Environmental Scarcity Theory, while recognising that the evidence indicates association and plausible mechanisms rather than individual-level causation.

5.2 Recommendations

Because livelihood collapse is the point at which the pathway to recruitment begins, national and county governments, working with development partners and the National Drought Management Authority, should scale up climate-adaptive livelihoods in the four counties, giving priority to Turkana and West Pokot where drought, conflict and recruitment reports were highest. Drought-resilient livelihood support, water-harvesting infrastructure and livestock insurance schemes would lessen the economic impact of drought and help to preserve herders' dignity and social identity, thereby reducing the vulnerability that recruiters exploit. Given the significant association between drought frequency and conflict incidence, and the observation that recruiters intensify their activity immediately after failed rainy seasons, the Kenya Meteorological Department, ICPAC, the National Drought Management Authority and county governments should connect meteorological forecasting with county-level conflict early-warning systems, so that timely, climate-informed information reaches security planners, humanitarian actors and community leaders at the same time and triggers a conflict-sensitive response before desperation peaks.

Since the study found that governance vacuums allow non-state actors to occupy the space left by under-resourced state services, national and county governments and security agencies should strengthen the presence and resourcing of state services and of legitimate conflict-resolution mechanisms in the ASAL counties, and should take account of land tenure, ethnicity and border politics in county security planning. Counter-extremism efforts should be community-based and should go beyond hard security responses to address the economic and identity dimensions of recruitment vulnerability. County governments, NGOs and community and religious leaders, whose knowledge informed this study, are well placed to lead this work, with particular attention to youth livelihood programmes and to women's economic empowerment in drought-affected areas, where the study documented heightened exposure to recruitment and early marriage. Finally, future research should extend the study period, widen the geographic scope to the border counties of Uganda and Ethiopia, and use geospatial analysis to map the spatial correlation between drought zones and clusters of extremist incidents at sub-county level, which would help to address the county-level limitation of the present analysis.

Declaration of Interest

The authors declare that they do not have any known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Funding Declaration

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

REFERENCES

- Adger, W. N., Pulhin, J. M., Barnett, J., Dabelko, G. D., Hovelsrud, G. K., Levy, M., Oswald Spring, Ú., & Vogel, C. H. (2014). Human security. In C. B. Field, V. R. Barros, D. J. Dokken, K. J. Mach, M. D. Mastrandrea, T. E. Bilir, M. Chatterjee, K. L. Ebi, Y. O. Estrada, R. C. Genova, B. Girma, E. S. Kissel, A. N. Levy, S. MacCracken, P. R. Mastrandrea, & L. L. White (Eds.), *Climate change 2014: Impacts, adaptation, and vulnerability. Part A: Global and sectoral aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (pp. 755–791). Cambridge University Press.
- African Union. (2022). *African Union climate change and resilient development strategy and action plan (2022–2032)*. African Union Commission.
- Armed Conflict Location & Event Data Project. (2023). *ACLED dataset: Kenya, 2010–2023* [Data set]. <https://acleddata.com>
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. <https://doi.org/10.1191/1478088706qp063oa>

- Burke, M., Hsiang, S. M., & Miguel, E. (2015). Climate and conflict. *Annual Review of Economics*, 7, 577–617. <https://doi.org/10.1146/annurev-economics-080614-115430>
- Burke, M. B., Miguel, E., Satyanath, S., Dykema, J. A., & Lobell, D. B. (2009). Warming increases the risk of civil war in Africa. *Proceedings of the National Academy of Sciences*, 106(49), 20670–20674. <https://doi.org/10.1073/pnas.0907998106>
- Busby, J. (2018). Taking stock: The field of climate and security. *Current Climate Change Reports*, 4(4), 338–346. <https://doi.org/10.1007/s40641-018-0116-z>
- Clement, V., Rigaud, K. K., de Sherbinin, A., Jones, B., Adamo, S., Schewe, J., Sadiq, N., & Shabahat, E. (2021). *Groundswell part 2: Acting on internal climate migration*. World Bank. <https://doi.org/10.1596/36248>
- CNA Corporation. (2007). *National security and the threat of climate change*.
- Creswell, J. W., & Plano Clark, V. L. (2018). *Designing and conducting mixed methods research* (3rd ed.). SAGE Publications.
- Funk, C., Peterson, P., Landsfeld, M., Pedreros, D., Verdin, J., Shukla, S., Husak, G., Rowland, J., Harrison, L., Hoell, A., & Michaelsen, J. (2015). The climate hazards infrared precipitation with stations—a new environmental record for monitoring extremes. *Scientific Data*, 2, Article 150066. <https://doi.org/10.1038/sdata.2015.66>
- Greiner, C. (2013). Guns, land, and votes: Cattle rustling and the politics of boundary (re)making in northern Kenya. *African Affairs*, 112(447), 216–237. <https://doi.org/10.1093/afraf/adt003>
- Gurr, T. R. (1970). *Why men rebel*. Princeton University Press.
- Guterres, A. (2021, September 23). *Statement at the Security Council open debate on climate and security* [Speech]. United Nations Framework Convention on Climate Change. <https://unfccc.int/node/306962>
- Hendrix, C. S., & Salehyan, I. (2012). Climate change, rainfall, and social conflict in Africa. *Journal of Peace Research*, 49(1), 35–50. <https://doi.org/10.1177/0022343311426165>
- Homer-Dixon, T. F. (1999). *Environment, scarcity, and violence*. Princeton University Press.
- Hsiang, S. M., Burke, M., & Miguel, E. (2013). Quantifying the influence of climate on human conflict. *Science*, 341(6151), Article 1235367. <https://doi.org/10.1126/science.1235367>
- International Monetary Fund. (2024). *Kenya: Staff report for the 2023 Article IV consultation, sixth reviews under the Extended Fund Facility and Extended Credit Facility arrangements, requests for augmentations of access, modification of performance criteria, waiver of nonobservance of performance criteria, waiver of applicability of performance criteria, and first review under the Resilience and Sustainability Facility arrangement* (IMF Country Report No. 24/13). <https://doi.org/10.5089/9798400264177.002.A001>
- Intergovernmental Panel on Climate Change. (2022). *Climate change 2022: Impacts, adaptation and vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* (H.-O. Pörtner, D. C. Roberts, M. Tignor, E. S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, & B. Rama, Eds.). Cambridge University Press. <https://doi.org/10.1017/9781009325844>
- Kelley, C. P., Mohtadi, S., Cane, M. A., Seager, R., & Kushnir, Y. (2015). Climate change in the Fertile Crescent and implications of the recent Syrian drought. *Proceedings of the National Academy of Sciences*, 112(11), 3241–3246. <https://doi.org/10.1073/pnas.1421533112>
- Kenya Meteorological Department. (2023). *State of the climate report Kenya (2022)*. <https://meteo.go.ke/publications/state-of-the-climate-report-kenya-2022>
- Kenya National Bureau of Statistics. (2019). *2019 Kenya population and housing census* (Vols. I–IV).
- Lind, J., Mutahi, P., & Oosterom, M. (2017). “Killing a mosquito with a hammer”: Al-Shabaab violence and state security responses in Kenya. *Peacebuilding*, 5(2), 118–135. <https://doi.org/10.1080/21647259.2016.1277010>
- Mkutu, K. A. (2008). *Guns and governance in the Rift Valley: Pastoralist conflict and small arms*. James Currey.
- National Drought Management Authority. (n.d.). *Towards Ending Drought Emergencies (TWENDE) project*. Retrieved October 8, 2026, from <https://ndma.go.ke/twende>
- National Drought Management Authority. (2023). *National drought early warning bulletins, January–December 2023* [Monthly bulletin series]. <https://knowledgeweb.ndma.go.ke>
- Okpara, U. T., Stringer, L. C., & Dougill, A. J. (2016). Lake drying and livelihood dynamics in Lake Chad: Unravelling the mechanisms, contexts and responses. *Ambio*, 45(7), 781–795. <https://doi.org/10.1007/s13280-016-0805-6>
- Okpara, U. T., Stringer, L. C., Dougill, A. J., & Bila, M. D. (2015). Conflicts about water in Lake Chad: Are environmental, vulnerability and security issues linked? *Progress in Development Studies*, 15(4), 308–325. <https://doi.org/10.1177/1464993415592738>
- Raleigh, C., Linke, A., & O’Loughlin, J. (2014). Extreme temperatures and violence. *Nature Climate Change*, 4(2), 76–77. <https://doi.org/10.1038/nclimate2101>
- Republic of Kenya. (2018). *National climate change action plan (Kenya) 2018–2022*. Ministry of Environment and Forestry.



- Schilling, J., Opiyo, F. E. O., & Scheffran, J. (2012). Raiding pastoral livelihoods: Motives and effects of violent conflict in north-western Kenya. *Pastoralism: Research, Policy and Practice*, 2, Article 25. <https://doi.org/10.1186/2041-7136-2-25>
- United Nations Development Programme. (2022). *Human development report 2021/2022: Uncertain times, unsettled lives: Shaping our future in a transforming world*. UNDP.
- United Nations Environment Programme. (2009). *From conflict to peacebuilding: The role of natural resources and the environment*. <https://wedocs.unep.org/20.500.11822/7867>
- United Nations Office for the Coordination of Humanitarian Affairs. (2022). *Horn of Africa drought: Regional humanitarian overview and call to action*. OCHA.
- University of Notre Dame Global Adaptation Initiative. (2023). *ND-GAIN country index*. University of Notre Dame. <https://gain.nd.edu/our-work/country-index/>
- Werrell, C. E., & Femia, F. (Eds.). (2013). *The Arab Spring and climate change: A climate and security correlations series*. Center for American Progress; Stimson Center; The Center for Climate and Security.