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United Nations peacekeeping as climate adaptation and conflict mitigation

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Abstract

United Nations peacekeeping operations (UN PKOs) are increasingly deployed in settings experiencing both violent conflict and climate change. Given this overlap, our paper presents an analytical framework for understanding how UN PKOs' conflict mitigation strategies may support climate adaptation. We focus specifically on activities UN PKOs undertake to address intercommunal violence related to natural resources impacted by climate change. In short, we argue that contemporary UN PKOs reduce the risk of intercommunal violence by engaging in de facto common-pool resource (CPR) management when deployed to climate-impacted settings, helping strengthen the institutions required to cooperatively manage shared resources like water for livestock. We generate this argument inductively, relying on qualitative evidence from four multidimensional UN PKOs in the Sudano-Sahelian zone—a region where intercommunal violence is increasing, partly due to the effect of climate change on shared grazing lands. These data highlight how contemporary UN PKOs' capacities for local patrolling, building infrastructure, and mediating disputes strengthen various aspects of CPR management and subsequently reduce the risk of intercommunal violence. Overall, this study meets practitioners' calls to better capture the impact of conflict mitigation strategies on climate adaptation and vulnerability.

Keywords

peace and security operations, climate change, adaptation, natural resources, conflict

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1. Introduction

Climate change threatens human well-being, particularly in fragile and conflict-affected settings. A key concern is that intensifying climate impacts will erode the foundations needed to build and sustain peace. For example, recent climate-driven flooding in South Sudan disrupted humanitarian access to displaced populations and heightened the risk of violence related to land-use conflicts along transhumance routes (International Rescue Committee, 2025). Although much research explores the security implications of climate change (Burke et al., 2015; Ide, 2017; Koubi, 2019; Mach et al., 2019), concrete strategies for supporting communities facing such destabilizing effects in conflict-affected settings remain elusive. Lacking a clear conceptual structure, designing and evaluating such strategies faces significant obstacles. This article addresses these challenges by introducing an analytical framework to explain how United Nations peacekeeping operations (UN PKOs) can simultaneously mitigate conflict and promote climate adaptation.

Contemporary UN PKOs deploy to settings actively experiencing or recovering from violent conflict with the goals of promoting peace, protecting civilians, strengthening local governance, and assisting in community reconstruction, supported by personnel from countries worldwide. Contemporary UN PKOs are concentrated in regions of acute climate vulnerability, particularly in Africa. According to one measure, the UN sent an average of 15,000 peacekeepers per deployment to 7 out of the 10 most climate-vulnerable countries in the world, highlighting the intersection of conflict, instability, and climate-related risks.[1] Worsening climate impacts in these countries pose significant challenges to peacebuilding, affecting stability through multiple channels. For UN PKOs, a critical concern is how climate change intensifies the risk of intercommunal violence, further complicating efforts to maintain peace and security (Hyman et al., 2020; McGuirk & Nunn, 2024).

While recent work explores the conditions under which UN PKOs adopt mandates that consider environmental issues (Bakaki & Bohmelt, 2021; Böhmelt, 2024), less well understood is how this orientation might prevent climate-related intercommunal violence. This uncertainty persists despite experts proposing UN PKOs as a tool for mitigating climate-driven conflict (Mach et al., 2019) while also noting how climate change can undermine the effectiveness of UN peacekeeping (Krampe, 2020). Thus, exploring how UN PKOs' activities might facilitate the peaceful resolution of intercommunal disputes in a climate-changed world is of critical importance to scholars and practitioners alike.

Here we present evidence—generated inductively through the open coding of operational reports from four UN PKOs deployed in the Sudano-Sahelian region of Africa—of how UN PKOs may reduce climate-related intercommunal violence by strengthening the institutions governing access to common-pool resources (CPRs) such as shared grazing lands (Ostrom, 1990). The goal of our analysis is twofold. First, we identify and describe the types of activities UN peacekeepers engage in when responding to disputes related to natural resources in climate-impacted settings. Second, we explore how these activities can support effective CPR management, specifically by linking them to one or more of Ostrom's (1990) design principles. Ultimately, we identify three day-to-day activities UN peacekeepers undertake which may support CPR governance: *building* physical infrastructure, frequent and local *patrolling*, and *mediating* local disputes.

This paper contributes to three distinct yet interrelated research agendas. First, it advances the debate on the linkages between climate change and conflict. By focusing on the role of CPR institutions, this study builds on existing research to provide a nuanced

understanding of how environmental stressors intersect with local governance structures to shape conflict dynamics (Barnett & Adger, 2007; Buhaug et al., 2021). Second, the paper answers practitioners' calls for more research conceptualizing how conflict mitigation may double as climate adaptation (Abrahams & Ober, 2024). Finally, the study contributes to the peacekeeping literature by demonstrating how UN PKOs can transcend their traditional roles to engage in environmental management and natural resource governance (Bakaki & Bohmelt, 2021; Beevers, 2019; Böhmelt, 2024; Hunnicutt, 2023).

Our article proceeds as follows: we begin with some discussion of existing research on the climate-conflict nexus and, in particular, its focus on institutions. We then use environmental governance research to trace how climate change erodes the institutions underpinning effective CPR management, resulting in lower levels of cooperation across settings and higher levels of intercommunal violence in conflict-affected settings specifically. Next, we briefly describe how UN PKOs have evolved over the last three decades into entities that do much more than "peacekeeping," such that they may be engaged in de facto CPR management today. Our main analysis follows, wherein we connect several on-the-ground practices of UN peacekeepers to the attributes of institutions that underpin effective CPR governance. Subsequently, we discuss the limitations of our analysis before concluding with a research agenda aimed at *evaluating* whether UN PKOs support effective CPR management and reduce intercommunal violence in settings dually impacted by climate change and conflict.

2. Climate change, conflict, and institutions

The relationship between climate change and conflict remains a topic of considerable debate. Some research suggests that climate change heightens the risk of both civil war (Burke et al., 2009; Hsiang et al., 2011) and smaller-scale political violence, including intercommunal conflict, protests, and riots (Fjelde & von Uexkull, 2012; Hendrix & Salehyan, 2012). This scholarship argues that climate change influences conflict through several mechanisms, such as the abundance or scarcity of natural resources (Homer-Dixon, 1999), economic conditions including agricultural productivity and food prices (Blakeslee & Fishman, 2018; Dell et al., 2012; Miguel et al., 2004), migration patterns (Koubi et al., 2021), and individuals' emotions (Anderson & Bushman, 2002). Conversely, other research contends that the connection between climate change and conflict is tenuous, if not entirely unfounded (Buhaug, 2010; Selby et al., 2017; Selby & Hoffmann, 2014). Even meta-analyses and systematic reviews of the climate-conflict literature yield conflicting conclusions (Burke et al., 2015; Koubi, 2019; Mach et al., 2019), potentially reflecting the epistemological diversity of the field (Ide, 2017).

Despite widespread disagreement about the aggregate effect of climate change on conflict, the current debate provides two crucial insights. First, the effect of climate on conflict is highly variable and extremely context-specific. This assertion resembles early scholarship on the environment and violence (Homer-Dixon, 1999), which depicts environmental scarcity as an "INUS condition", or an insufficient but necessary part of a an unneccessary but sufficient condition to observe some outcome (Mackie, 1965). That is, environmental scarcity is a factor that, when simultaneously operative alongside a larger set of factors, can cause violence; but the same violence may stem from other sets of factors that do not include environmental scarcity. A second, related insight from the climate-conflict debate is that social and political institutions almost invariably moderate the effect of climate change on conflict (Barnett & Adger, 2007; Buhaug et al., 2021). When faced with growing climate impacts, societies may—and often do—adapt. Various institutions influence the prospects for and

nature of this adaptation, and thus are critical for understanding the conditions under which climate change will lead to conflict. For example, informal institutions governing access to Kenya's Loita forest preempted the outbreak of violence when increased rainfall variability exacerbated local competition over grazing lands (Adano et al., 2012). Other research shows that exclusionary political institutions, which marginalize certain ethnic groups, amplify the positive relationship between drought, rainfall shocks, and intercommunal violence (Fjelde & von Uexkull, 2012).

While existing research underscores the critical role of institutions in the climate-conflict nexus, less attention has been paid to identifying the qualities of institutions that successfully prevent climate-induced conflict. We build on this literature by focusing on CPR institutions, which play a crucial role in regulating access to natural resources like shared grazing lands.

3. Climate change and CPR institutions

Our argument begins by tracing how climate change can erode existing CPR institutions, thereby reducing cooperation between different user groups as resource scarcity increases. CPRs are natural or human-made resources that are open-access ("non-excludable") but finite in use ("subtractible"). Despite initial pessimism about the fate of CPRs (Hardin, 1968), an expansive body of evidence documents how communities sustain CPRs through the use of effective institutions (see Feeny et al. (1990) and Agrawal (2003) for early reviews). In particular, Ostrom (1990) documents and analyzes the emergence of diverse institutions which help communities around the world sustainably manage CPRs. These institutions—ranging from *zanjeras* regulating shared irrigation systems in the Philippines to communal systems of land tenure restricting access to pastures in the Alps—adhere to several "design principles" which make them effective.

Ostrom (1990) identifies several key design principles that support effective governance of CPRs. First, *Clearly Defined Boundaries*—resource boundaries and appropriators (i.e., individuals and households with access to the resource) must be clearly identified. Second, *Congruence Between Rules and Local Conditions*—appropriation and provision rules should align with local ecological and social conditions. Third, *Collective-Choice Arrangements*—most appropriators participate in decision-making to modify operational rules. Fourth, *Monitoring*—monitors who are (accountable to) appropriators regularly track CPR conditions and appropriator behavior. Fifth, *Graduated Sanctions*—sanctions for rule violations are proportional to the severity of the offense and administered by either the appropriators themselves or an accountable entity. Sixth, *Conflict Resolution Mechanisms*—low-cost and rapid dispute resolution systems are available to appropriators. Finally, *Minimal Recognition of Rights to Organize*—external authorities recognize appropriators' rights to self-organize CPR governance.

The impacts of climate change on the physical characteristics of CPRs are well-documented. For instance, shifting precipitation patterns and rising temperatures have altered the availability and productivity of grazing lands, affecting pastoralist livelihoods and increasing the likelihood of resource-based conflicts (Sloat et al., 2018). Similarly, climate change has contributed to declining groundwater levels and increased variability in recharge rates, posing serious challenges for communities reliant on aquifers for drinking water and irrigation (Wu et al., 2020). In forested regions, rising temperatures and prolonged droughts have exacerbated tree mortality and altered species composition, threatening the stability of forest-dependent economies and governance systems (McDowell et al., 2020). Fisheries, too, have

been profoundly affected, as ocean warming, acidification, and deoxygenation drive shifts in fish stock distributions and reduce the productivity of many marine and freshwater ecosystems, often disrupting established access arrangements and increasing competition over dwindling resources (Sumaila et al., 2011).

Beyond these physical changes, climate change also has the potential to reshape the social dynamics of CPR systems. One key mechanism is migration, as climate-induced resource degradation may force populations to relocate in search of more viable livelihoods, thereby altering established user groups and increasing the potential for disputes over resource access (Feng et al., 2010). Adaptation and mitigation initiatives, such as reforestation programs, water conservation projects, and renewable energy infrastructure, can additionally lead to the reallocation of land and resources, sometimes resulting in the displacement of local populations or the restructuring of traditional governance systems (De Sherbinin et al., 2011). These disruptions can weaken existing institutional arrangements and undermine cooperation, exacerbating tensions in regions where resource competition is already high.

The physical and social impacts of climate change may contribute to the erosion of existing CPR institutions, especially those designed prior to the acceleration of climate change in the late 20th century. For example, consider a CPR institution governing several communities' access to groundwater in a peri-urban area. Imagine that the communities formed the institution during the 19th century, and that, due to climate change, (a) the groundwater basin has gotten smaller, (b) its level has become more variable, (c) the communities' populations have grown as people from more rural, drought-prone areas in the country have begun migrating toward major urban centers, and (d) the country's central government has established a new groundwater management agency which can overrule local rules about groundwater use. Given these conditions, there are many reasons to believe the communities' CPR institutions would break down in the future. The changing extent and level of the groundwater basin would require the communities to demarcate new boundaries, as would the influx of migrants from even more drought-prone areas. New variation in groundwater levels would throw the CPR institutions' existing allocation rules out of alignment with local conditions, and the communities would need to consider possible changes in management rules that account for their new, larger populations. At the same time, it is not given that government officials in the new groundwater management agency would recognize the communities' allocation and management rules as legitimate. Navigating these uncertainties might undercut individual appropriators' incentives to contribute to sustainable groundwater management, ultimately increasing overextraction.

Indeed, research shows how climate change can undermine existing CPR institutions via the processes described above (Jodha et al., 2012). Schlager and Heikkila (2011) provide first-hand evidence of climate change overwhelming the historical compacts allocating access to shared waterways like the Colorado River in the American West. Experimental evidence also confirms that heightened uncertainty about the availability of CPRs can lead its users to underinvest in the institutions governing access (Dipierri & Zikos, 2020; Safarzynska, 2018).

When the institutions governing CPRs begin to erode, competition between different users over the remaining resources increases. For example, a growing population and increasingly complex hydrological dynamics led to the breakdown of effective groundwater governance in San Bernardino County, subsequently inciting use-conflicts between local agricultural and industrial interest groups (Ostrom, 1990). Population growth similarly overwhelmed the

institutions managing local fisheries in the Sri Lankan town of Mawelle, and clashes between fishermen and police ensued (Ostrom, 1990).

4. CPR institutions and intercommunal violence

As CPR institutions deteriorate, escalating resource competition can spark broader social unrest, particularly in contexts where alternative governance mechanisms are weak or absent. The next stage of our argument explores how these dynamics contribute to heightened levels of intercommunal violence in conflict-affected settings. Specifically, we examine how climate-induced pressures on CPR institutions create conditions conducive to violent competition between social groups, often in the absence of state intervention.

Intercommunal violence is distinct from other forms of political violence in that it occurs without the direct involvement of state actors or insurgent groups. Instead, it involves individuals or social groups operating independently of the state, typically with low levels of organizational complexity. These groups are often bound by a shared identity—such as race, ethnicity, clan, or tribe—shaping the nature of their conflicts (Sundberg et al., 2012). The drivers of intercommunal violence vary widely: disputes may arise when traditional land boundaries clash with formal legal demarcations, when displacement from civil wars or severe droughts forces different communities into competition, or when political parties and armed groups deliberately inflame ethnic divisions for strategic gain. The consequences of such violence are profound. In sub-Saharan Africa alone, intercommunal conflicts have claimed nearly 250,000 lives since the turn of the century—surpassing the number of deaths caused by violence perpetrated by governments and rebel groups (Raleigh et al., 2010).

The erosion of CPR institutions often precedes bouts of intercommunal violence in conflict-affected settings experiencing climate change. Perhaps nowhere is this trend more prominent than Africa's Sudano-Sahelian region, where climatic variability is contributing to increasing conflict between and among agricultural and transhumant pastoralist communities. Indeed, a large literature debates the causes and consequences of agropastoral conflict across the Sahel and into Sudan (see Adams et al., 2023 for a recent synthesis). We review its findings below, focusing specifically on the institutions governing access to shared grazing resources, how they have evolved in the last 50 years, and how their erosion today contributes to intercommunal violence.

In the pre-colonial period, agricultural and pastoral communities across the Sahel maintained what many label as symbiotic host-client relationships rooted in norms of reciprocity (Haller, 2010; Moritz, 2010). Various common property regimes and local institutions governed these relationships, promoting the management of shared infrastructure and peaceful dispute resolution. During the colonial period, some existing arrangements for managing shared grazing resources were integrated into the colonial state while others were dissolved outright. This trend toward institutional change and pluralism continued after World War II, particularly as newly formed post-colonial governments pursued agricultural expansion and mineral extraction by granting land to private actors.[2] Nonetheless, many claim that traditional relationships and systems of self-governance still support pastoral commons management in the Sahel, acknowledging that West African pastoral systems do not fit neatly into Ostrom (1990)'s conceptual framework (Jyothi, 2022; Moritz et al., 2013).

Of course, the shift toward privatizing shared grazing resources in the Sahel both disrupted historical CPR institutions and increased conflicts between different user groups, contributing to the heightened level of agropastoral violence observed today (Adams et al.,

2023). Recent research indicates climate change is amplifying these dynamics as well, primarily by reshaping pastoralists' seasonal migration patterns (McGuirk & Nunn, 2024; Nwankwo, 2024). Historically, transhumant pastoralists in the Sahel graze their livestock on marginally productive lands during the wet season, allowing agriculturalists to cultivate crops on more productive lands. Following the onset of the dry season, pastoralists migrate to graze their livestock on agriculturalists' recently harvested lands, where phytomass is available year-round. Several arrangements formed between pastoralists and agriculturalists govern this migration, including those establishing migration corridors and mechanisms for dispute resolution (Stenning, 1994). However, increased rainfall variability resulting from climate change has resulted in earlier and more expansive dry-season migrations by transhumant pastoralists. This early migration renders existing grazing arrangements irrelevant, that is, they are no longer in congruence with local conditions. As a result, intercommunal violence sometimes occurs when pastoralists' livestock destroy crops or consume resources still required for cultivation (Brottem, 2016; Kitchell et al., 2014; Moritz, 2010).

It follows from this evidence that factors which help adapt existing institutions for managing CPRs in conflict-affected settings experiencing climate change may reduce the risk of intercommunal violence. The following section presents our analysis of how contemporary UN PKOs may achieve this goal.

5. Multidimensional UN peacekeeping and CPR management

To identify how contemporary UN PKOs might bolster CPR management and reduce climate-related intercommunal violence, we review all publicly available Reports of the Secretary General (hereafter, "Reports") as of December 2024 for the United Nations Multidimensional Integrated Stabilization Mission in the Central African Republic (MINUSCA), the United Nations Multidimensional Integrated Stabilization Mission in Mali (MINUSMA), the United Nations African Union Hybrid Mission in Darfur (UNAMID), and the United Nations Mission in South Sudan (UNMISS).[3] Deployed PKOs publish Reports multiple times per year both to document important political, economic, and security-related developments within a mission's host-country and to track a mission's progress toward implementing its mandate.

The UN Security Council authorized a mandate for all four missions in our sample under Chapter VII of the UN Charter. Until the 1990s, UN PKOs narrowly worked to monitor ceasefires between countries and, on occasion, rebel group disarmaments. However, the failures of the early UN PKOs in Rwanda and elsewhere led to then UN Secretary-General Kofi Annan commissioning a panel to assess the shortcomings of past UN peace operations. This panel, led by former Algerian Foreign Minister Lakhdar Brahimi, released a report (the "Brahimi Report") calling for UN PKOs to prioritize local-level activities to prevent the violent escalation of intercommunal disputes, rebuild social trust, and restore confidence in local institutions (Hultman et al., 2020; Nomikos, 2025; Nomikos & Villa, 2022). To achieve the doctrinal shift recommended in the Brahimi Report, UN PKOs began deploying under Chapter VII of the UN Charter. These "multidimensional" PKOs authorize their personnel to intervene in economic, political, and social processes related to peacebuilding. For example, multidimensional UN PKOs are tasked with restoring the rule of law (Blair, 2021), promoting gender equality (Karim & Beardsley, 2017), monitoring post-conflict elections (Smidt, 2020), delivering humanitarian aid (Sauter, 2022), and—central to the goals of this

paper—engaging in the management of natural resources (Bakaki & Bohmelt, 2021; Beevers, 2019; Böhmelt, 2024; Hunnicutt, 2023).

We focus on MINUSCA, MINUSMA, UNAMID, and UNMISS for two reasons, in addition to each mission's multidimensional operational mandate. First, each mission is or was recently deployed to a host country that is highly vulnerable to climate change (Figure 1). The Notre Dame Global Adaptation Initiative (ND-GAIN) annually evaluates countries' vulnerabilities to climate change along two dimensions: their current and projected experiences of climate change's impacts and their capacities to engage in effective climate adaptation. The Central African Republic, Mali, and Sudan are among the most climate-vulnerable countries globally along both elements of the ND-GAIN index, both currently and historically. Alternative measures from the International Monetary Fund's Climate-driven INFORM Risk Indicator confirm that the host countries of mission in our sample are among the most vulnerable to climate change globally.

Second, the effects of climate change on transhumant pastoralism appear linked to intensified intercommunal violence in all four host countries. Reporting suggests that armed groups increase their recruiting efforts during drought conditions in an effort to enlist struggling pastoralists (Ojewale, 2022). To the same point, the UN Office for the Coordination of Humanitarian Affairs claims that the link between climate change and violence in South Sudan is "inextricable" (United Nations Office for the Coordination of Humanitarian Affairs, 2022). Indeed, at least one Report from each mission in our sample explicitly attributes intercommunal violence to rising tensions between transhumant pastoralists and the host communities with whom they share grazing lands during the dry season (Table 2).

Within each Report, our goal is to identify instances of UN peacekeepers engaged in activities related to disputes concerning natural resource management and governance specifically. That is, we exclude from our analysis reported activities that appear unrelated to natural resources. This exclusion criterion is appropriate given the purpose of our article: to highlight how UN peacekeepers are engaged in activities that can support effective CPR management and subsequently mitigate climate-related conflict. We recognize that peacekeepers engage in a wide range of activities for diverse purposes; however, our aim here is specifically to isolate and analyze those practices that plausibly support CPR governance.

We engaged in the open coding of Reports in a grounded theoretical and inductive approach (Charmaz, 2006). First, each author reviewed the 161 reports in our sample, to identify instances wherein UN peacekeeping personnel were engaged in activities related to CPR management and governance. This coding process revealed three clusters of activities related to CPR management and governance that UN peacekeepers in our sample of missions regularly engaged in: *building* physical infrastructure, frequent and local *patrolling*, and *mediating* local disputes. We then recoded all 161 reports in our sample with these focused codes (or categories) in mind.

Our analysis additionally features data drawn from two other UN-based sources. First, we review press releases from missions in our sample. These press releases contain more detailed information about the events and activities referenced in missions' Reports; hence, they enable us to better characterize how multidimensional PKOs may be engaged in de facto CPR management. Second, we review a UN Department of Peace Operations' policy document on how PKOs manage transhumance-related conflict (Hyman et al., 2020). Like missions' press releases, this policy document enables more precise description of PKOs' activities on the ground.

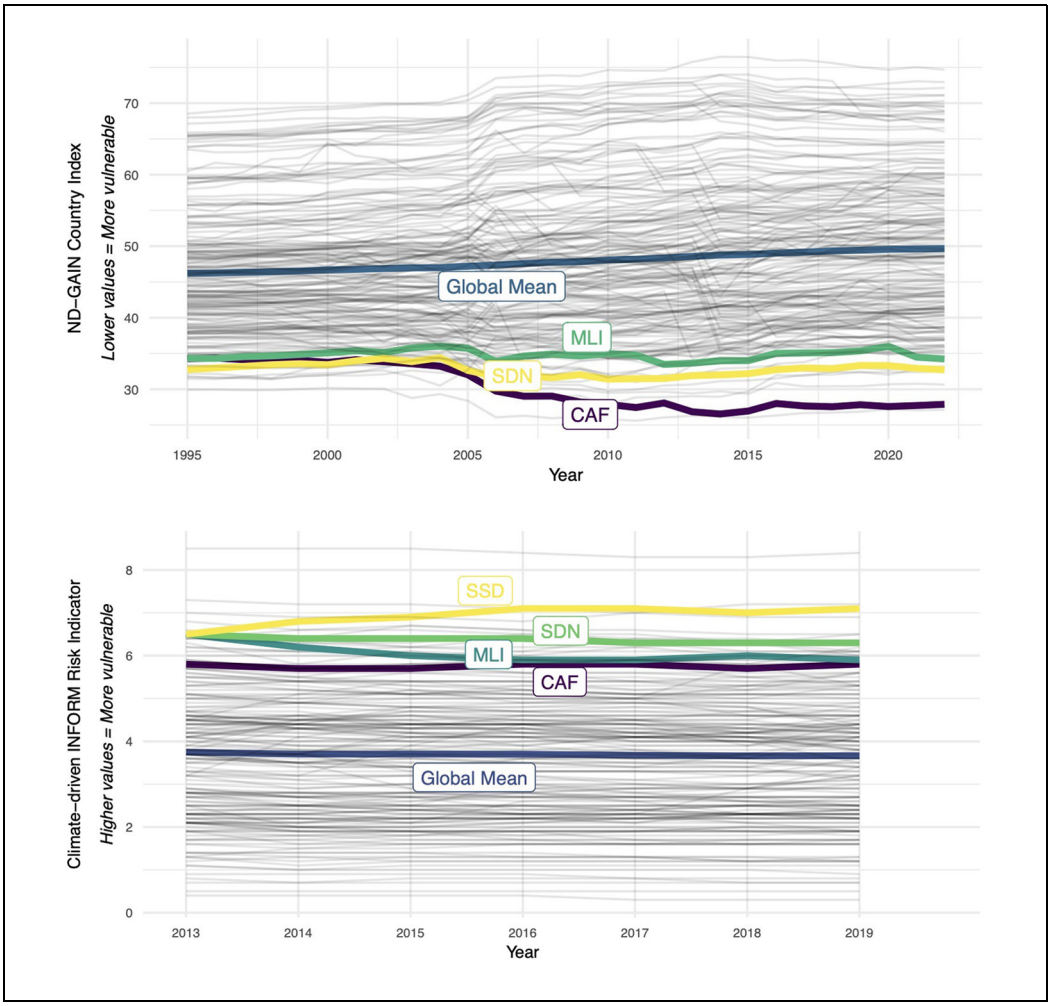

Figure 1. MINUSCA, MINUSMA, UNAMID, and UNMISS operate in some of the world's most climate-vulnerable countries.

Note. (a) Visualizes over time and between-country variation in the ND-GAIN Country Index, which is a composite measure of vulnerability to climate change. Lines in black correspond to countries where the peacekeeping missions in our sample have not deployed. Data accessed here, January 30, 2025. (b) Visualizes over time and between-country variation in the IMF Climate-driven INFORM Risk Indicator, which is a composite measure of vulnerability to climate change. Lines in black correspond to countries where the peacekeeping missions in our sample have not deployed. Data accessed here, January 30, 2025. IMF = International Monetary Fund; ND-GAIN = Notre Dame Global Adaptation Initiative; MINUSCA = United Nations Multidimensional Integrated Stabilization Mission in the Central African Republic; MINUSMA = United Nations Multidimensional Integrated Stabilization Mission in Mali; UNAMID = United Nations African Union Hybrid Mission in Darfur; UNMISS = United Nations Mission in South Sudan.

The following section presents the results of our focused coding, which Tables 1 and 2 summarize. In short, we describe below how each set of natural resource-related activities UN peacekeepers engage in—building, patrolling, and mediating—may strengthen CPR

Table 1. Summary of UN mission reports.

Mission	Total reports	First report	Last report	Build	Patrol	Mediate
MINUSCA	26	November 1, 2014	June 1, 2024	0	4	9
MINUSMA	36	November 1, 2012	January 1, 2022	1	2	5
UNAMID	52	August 1, 2007	April 1, 2019	5	6	23
UNMISS	47	November 1, 2011	October 1, 2024	0	9	18

Note. Tallies the number of reports reviewed per mission and notes the dates on which each mission's first and last report was published. In addition, counts provided in the "Farmer–Herder" column represent the number of reports per mission where intercommunal violence is attributed to conflict between transhumant pastoralists and sedentary agricultural communities, often due to disagreements over shared natural resources. Finally, counts in the final three columns ("Build," "Patrol," and "Mediate") represent the number of reports per mission describing peacekeeping personnel engaging in de facto resource governance through the pathways we describe in this article.
MINUSCA = United Nations Multidimensional Integrated Stabilization Mission in the Central African Republic; MINUSMA = United Nations Multidimensional Integrated Stabilization Mission in Mali; UNAMID = United Nations African Union Hybrid Mission in Darfur; UNMISS = United Nations Mission in South Sudan.

Table 2. Ostrom's design principles, definitions, peacekeeping activities, and examples.

Design principle	Definition	PKO activity	Example
Clearly defined boundaries	Resource boundaries and appropriators (i.e., individuals and households with access to the resource) must be clearly identified.	Patrol	UNAMID and MINUSCA demarcated transhumance routes and shared water points using maps and patrol data (e.g., Reports A and E).
Congruence between rules and local conditions	Appropriation and provision rules should align with local ecological and social conditions.	Build	UNAMID restored over 100 rihoods (rainwater catchments) to better align access rules with early pastoralist migration patterns due to climate change (Report C).
Collective-choice arrangements	Most appropriators participate in decision-making to modify operational rules.	Mediate	UNAMID facilitated intercommunal dialogue forums in Darfur with over 650 participants to set shared rules for grazing and water use (Report F).
Monitoring	Monitors who are (accountable to) appropriators regularly track CPR conditions and appropriator behavior.	Patrol	MINUSMA conducted long-range patrols in Mopti and supported infrastructure mapping to monitor seasonal cattle migration (Report D).
Graduated Sanctions	Sanctions for rule violations are proportional to the severity of the offense and administered by either the appropriators themselves or an accountable entity.	Mediate, Patrol	MINUSMA's local presence enabled return of raided cattle and revival of restorative sanctions after mediation in Ogossogou (Report I).
Conflict resolution mechanisms	Low-cost and rapid dispute resolution systems are available to appropriators.	Mediate	UNMISS supported mobile courts in Warrap and Western Bahr El Ghazal to resolve

(continued)

Table 2. (continued)

Design principle	Definition	PKO activity	Example
			farmer-herder disputes where formal venues were inaccessible (Report H).
Minimal recognition of rights to organize	External authorities recognize appropriators' rights to self-organize CPR governance.	Mediate	UNMISS promoted the Marial Bai Agreement through dialogue and dissemination to harmonize local practices with national norms (United Nations Mission in South Sudan (UNMISS), 2018, 2024a).

Note. MINUSCA = United Nations Multidimensional Integrated Stabilization Mission in the Central African Republic; MINUSMA = United Nations Multidimensional Integrated Stabilization Mission in Mali; UNAMID = United Nations African Union Hybrid Mission in Darfur; UNMISS = United Nations Mission in South Sudan.

governance in conflict-affected settings experiencing climate change and, subsequently, prevent the violent escalation of local disputes.

6. Build

The UN has authorized its multidimensional PKOs to deliver "Quick Impact Projects" (QIPs), acknowledging how increasing access to essential services like drinking water is critical to achieving positive peace. QIPs are small development projects meant to sustain service provision in areas that remain inaccessible to humanitarian actors due to security reasons (United Nations, 2022). For example, the UNMISS helped clear vegetation around and construct a solar-powered water system for three communities in a conflict-prone area of Juba (United Nations, 2017). The UN Department of Peace Operations instructs multidimensional PKOs to use QIPs as a tool for building public confidence in the mission. Civilians may be more likely to provide peacekeepers with actionable information on activities of armed groups after peacekeepers have made a physical investment in their community's well-being.

Our argument identifies another pathway through which QIPs may promote peace specifically in the conflict-affected settings experiencing climate change: by ensuring congruence between local conditions and the rules CPR institutions specify. Recall that CPR institutions are less effective when they specify rules about access and management that do not match the ecological and social characteristics of the CPR system. Climatic variability can throw CPR institutions out of alignment with local conditions, such that appropriators are less likely to cooperatively manage the CPR. And in settings where the rule of law is extremely weak, these disputes are likely to escalate to violence. But QIPs can help reduce the misalignment between local conditions and access rules, ultimately reducing the risk of intercommunal violence. Let us consider an example of this process using a case from UNAMID.

Increased rainfall variability resulting from climate change is occurring alongside rising levels of agropastoral conflict in the Darfur region of Sudan. Pastoral groups in Darfur

migrate southwards during the dry season, when the Sahara overtakes grazing lands in Northern Darfur. This southward migration has been occurring earlier in the year as climate change has increased the variability of rainfall in Darfur. Thus, the historic arrangements dictating pastoralists' access to agricultural lands for grazing in Southern Darfur are no longer congruent with local ecological conditions: pastoralists must depart their ancestral lands to graze livestock on shared lands in the south earlier than before due to increased climatic variability. This early migration results in pastoralists' livestock destroying agricultural communities' crops, exacerbates competition for arable land and water, increases intercommunal disputes, and, in some cases, heightens the risk of intercommunal violence. In some areas, violence between farmers has displaced hundreds.

To help relieve the pressure on grazing and water resources, peacekeepers attached to the African Union-United Nations Hybrid Operation in Darfur (UNAMID) used QIP funding to restore over 100 *rihoods*, natural catchments for rainwater that transhumant herders use during the dry season (Report C, Table A1). Local leaders reported the mission's rihood restoration project reduced the number of incidents of crop destruction, provided better grazing lands to herders, and improved relations between farming and herding communities. In the Abu-Naeema village—a hotspot for farmer-herder conflict—approximately 500 households that fled during previous bouts of intercommunal violence returned after completing the rihood project. One community leader in Abu-Naeema remarked that no major security incidents had occurred since the rihoods' completion and that most minor disputes were quickly and peacefully resolved (Hyman et al., 2020).

7. Patrol

Local patrolling is an essential part of UN peacekeeping, as it enables mission personnel to monitor countless peacebuilding processes such as the implementation of ceasefire agreements (Doyle & Sambanis, 2006; Fortna, 2008), elections (Smidt, 2020), and the activities armed groups (Fjelde & Smidt, 2022). Indeed, contemporary UN PKOs now equip their personnel with geospatial technologies to enhance the information-gathering capacity of local patrols. In recent years, these local patrols commonly focus on observing interactions between communities in the commons, as the violent escalation of intercommunal disputes regarding resource access has become more prominent (Nomikos, 2022).

Our argument suggests that UN PKOs' local patrolling may reduce climate-related intercommunal violence by strengthening several of Ostrom's design principles. First, the information UN peacekeepers collect while on patrol can help sustain the monitoring of CPRs throughout climate shocks, enabling appropriators to maintain clearly defined boundaries. Recall that climate change can dramatically reshape the physical and social boundaries of a CPR, requiring appropriators to demarcate new boundaries. Generating the information required to demarcate these new boundaries and subsequently monitoring compliance with them may be too costly for appropriators in conflict-affected settings, where government and local resources are limited. Contemporary UN PKOs can help appropriators overcome this barrier by monitoring how a CPR's boundaries and use change. A key example of this process is when UN peacekeepers facilitate the demarcation of transhumant pastoralists' migration routes.

Transhumance differs from other forms of nomadic migration because it occurs along pre-established routes that pastoralists have used historically. Demarcating these routes is critical for ensuring cooperation between farmers and herders in the commons, for example,

by specifying where herders may graze their cattle on agricultural lands or where herders may allow their cattle to drink shared water resources. Traditionally, government and local authorities have organized meetings where representatives from farming and herding communities would work to demarcate migration routes prior to the onset of the migration season. However, persistent insecurity and corresponding declines in state authority have interrupted this practice, exacerbating existing uncertainty about transhumance migration in the Sudano-Sahel that climate change has induced over the last decade. The missions in our sample commonly report tasking their personnel with demarcating transhumant pastoralists' migration routes, utilizing information gathered through frequent patrolling. MINUSCA partnered with representatives from other UN agencies to provide a detailed map of the infrastructure pastoralists rely on (e.g., shared water catchments) during their seasonal migration along the Chad-Central African Republic border (Hyman et al., 2020), following long-range patrols along migratory corridors (Report E, Table A1). UNAMID personnel began working to demarcate pastoralists' migration routes and infrastructures as early as 2010, when they mapped the locations of shared water pools and reservoirs along migration routes in Darfur (Report A, Table A1). Following persistent tensions between farmers and herders the Mopti region in 2015, MINUSMA funded a QIP to support the demarcation of roads for seasonal cattle migration in 15 of Mopti's *communes* to prevent further conflicts from arising (Report D, Table A1).

In addition, UN peacekeepers' frequent patrolling can strengthen Ostrom's fifth and sixth design principles—graduated sanctions and accessible mechanisms for conflict resolution—to help ensure disputes between CPR users do not escalate to violence. Disputes over shared grazing lands in the Sudano-Sahel typically escalate to violence due to the lack of accessible and effective venues for dispute resolution. Indeed, one early UNAMID report attributes an uptick in intercommunal violence in Darfur to the inaccessibility of "traditional conflict-reconciliation practices" regarding "resource-management mechanisms" (Report A, p. 4, Table A1). Absent access to effective mechanisms for conflict resolution, reprisal killings for violating arrangements pertaining to the use of shared grazing lands are common (Report B, Table A1). When UN peacekeepers are present in hotspots for farmer-herder conflict, they may directly deter this extrajudicial violence or make its onset less likely by lowering the barriers to accessing the institutions used to resolve farmer-herder conflicts.

For example, peacekeepers attached to UNMISS frequently patrol through known hotspots for farmer-herder conflict to prevent the violent escalation of disputes concerning shared resources (United Nations Mission in South Sudan (UNMISS), 2017). South Sudan's state of Eastern Equitoria experienced an uptick of intercommunal violence in early 2022, as the early arrival of pastoralists onto agricultural lands led to crop destruction, looting, and a series of reprisal killings. UNMISS stepped up patrols in the state in response, with the immediate goal of physically deterring additional violence. Moreover, UNMISS systematically embedded its Civil Affairs Officers in these patrols to facilitate dialogue about peaceful dispute resolution. Similar responses by UNMISS—whereby increased local patrolling is intended to deter extrajudicial violence related to resource conflicts and restore appropriators' access to local conflict resolution mechanisms—are credited with reducing tensions between farmers and herders (Report H, Table A1).

MINUSMA similarly relies on frequent local patrolling to promote the peaceful resolution of disputes between farmers and herders by strengthening Ostrom's design principles on graduated sanctions and conflict resolution mechanisms. In late 2022, MINUSMA established a temporary operating base in Ogossogou, a village where tensions between farmers

and herders have frequently escalated to violence. Establishing this temporary operating base allowed for more frequent patrolling around Ogossogou, triggering a series of changes regarding the sharing of resources between farmers and herders. Initially, the temporary operating base enabled MINUSMA personnel to work with regional partners in supporting intercommunal dialogues mediation and reconciliation efforts. As a result of these intercommunal dialogues, the use of graduated sanctions for violating rules regarding shared grazing lands returned, for example, cattle raided during earlier reprisal attacks were returned. The reported aggregate effect of these activities was the peaceful resumption of nearby agricultural and pastoral activities, suggesting that MINUSMA's presence strengthened CPR governance (Report I, Table A1).

8. Mediate

Many contemporary UN PKOs are mandated to reduce intercommunal conflict by supporting existing or creating new venues for dispute resolution. For example, UN police officers deployed with MINUSCA in the Central African Republic have collaborated closely with the national police to address issues related to gender-based violence. In one case, UN personnel held intercommunal dialogues on gender in schools in Bangui that aimed to raise awareness, foster a culture of respect and equality among youth, and ultimately build trust between the community and law enforcement (United Nations Peacekeeping, 2024).

Our argument suggests that UN peacekeepers' capacities for mediation can reduce climate-related intercommunal violence by strengthening Ostrom's third, fifth, sixth, and seventh design principles: collective choice arrangements, graduated sanctions, conflict resolution mechanisms, and minimal recognition of rights to organize.

First, the UN PKOs in our sample support the extension of mobile courts to areas experiencing heightened tensions over shared natural resources. These mobile courts may reduce intercommunal violence resulting from tensions over shared grazing lands, as we describe below, by increasing the availability of conflict resolution mechanisms. For example, intercommunal conflict is common along the border of Warrap and Western Bahr El Ghazal, two South Sudanese states where the seasonal migration of cattle heightens tensions between farmers and herders who share land and water resources. These tensions often escalate to violence, partly because persistent insecurity and long-term demographic changes have made historical mechanisms for conflict resolution inaccessible. In response, UNMISS began logistically supporting the deployment of a Joint Special Mobile Court in hotspots of agro-pastoral conflict across Warrap and Western Bahr El Ghazal (Report H, Table A1). One specific function of this mobile court is to respond to and resolve conflicts between farmers and herders when formal venues for conflict resolution are overburdened and informal venues for conflict resolution are ill-equipped to handle the complexity of incoming (UNMISS, 2024b). The Joint Special Mobile Court UNMISS supported in Western Bahr El Ghazal in 2021 adjudicated 24 cases involving disputes between farmers and herders over shared resources. One local leader reported that deployment of these mobile courts "definitely improved the security situation," referring to a cooling of tensions between farmers and herders in two communities in Warrap state (UNMISS, 2023). One other testimony stresses how the deployment of mobile courts "reduced criminality and promoted ownership as well as trust among people who are impacted by seasonal cattle migration" (UNMISS, 2022).

Second, the UN PKOs in our sample facilitate intercommunal dialogues between farmers and herders, with the goal of negotiating new agreements for the shared use of water resources and grazing lands among key stakeholders. Indeed, the UN PKOs in our sample frequently organize pre- and post-migration conferences. The resulting intercommunal meetings take place before and after the transhumance season, with the explicit goals of enabling farmers and herders (a) to mutually establish ground rules for the migration season (e.g., arrangements for sharing resources) and (b) to reflect and revise as needed those ground rules in preparation for the next transhumance season. Such dialogues may reduce intercommunal violence from disputes over shared resources by strengthening collective choice arrangements.

For example, UNAMID organized four dialogue forums in West Darfur in November 2017, bringing together farmers and herders from the villages Tonvoka, Terbibba, Nuri, and Birkilab (Report F, Table A1). Over 650 people attended these forums, including women and youth groups: stakeholders historically excluded from decision-making about farmer-herder relations. Participants used these forums to make explicit how farmers and herders were to use shared resources during the transhumance season. Farmers were reminded to cultivate crops away from water points that herders' livestock rely on, while herders were reminded to graze their cattle on non-agricultural lands. In addition, these forums produced recommendations for mitigating farmer-herder tensions that UNAMID and its government partners could implement, such as the demarcation of transhumance routes and construction of critical infrastructure for managing shared resources (e.g., additional water points). The mission organized subsequent forums as the migration season got underway in early 2018, resulting in the cooling of intercommunal tensions (Report G, Table A1).

Third, the UN PKOs in our sample play an instrumental role in harmonizing higher-level policies about transhumance migration and farmer-herder relations with local mechanisms for monitoring resource use, ensuring the use of graduated sanctions for rule violations, and resolving conflict. In other words, when UN PKOs assist in the alignment of local, regional, and national practices for managing CPRs, they may preempt intercommunal violence by reinforcing CPR appropriators' rights to self-organize. We distinguish the role of mediation from patrolling here by emphasizing that mediation involves voluntary engagement and the application of graduated sanctions within existing conflict resolution frameworks, whereas patrolling reinforces involuntary compliance through monitoring and deterrence.

A compelling example of this process is the Marial Bai Agreement (UNMISS, 2016; Planetary Security Initiative, 2024; Adie et al., 2021). Conflicts between farmers and herders regarding the use of shared resources are common in the South Sudanese states of Gagrial, Tonj, and Wau. Traditional leaders and government officials from these three states began convening in 2014 to identify strategies for reducing farmer-herder conflict, resulting in the ratification of the Marial Bai Agreement. The agreement sets forth various rules for governing the use of shared resources during the transhumance season, such as procedures for pastoralists to move livestock through and establish camps near agricultural settlements, compensation prices for damaged crops and livestock to avoid reprisal killings, and guidelines outlining when herders are to arrive on shared grazing lands at the beginning of the dry season.

UNMISS played a critical role in supporting the implementation of the Marial Bai agreement in two ways. First, UNMISS worked to disseminate the agreement to communities across South Sudan where conflict between farmers and herders is common during the migration season. For example, UNMISS's Civil Affairs Division distributed over 200

copies of the agreement at a community forum in Tonj County in 2018, to "create awareness to the pastoralists communities about [the agreement], ahead of migration" (UNMISS, 2018). Forum attendees—predominantly, cattle camp leaders—reported having a better understanding of the agreement as a result, particularly procedures to be implemented with host communities (e.g., about shared resource use) prior to the migration season. Second, UNMISS continuously works to facilitate dialogues enabling stakeholders from across South Sudan can participate in updating the terms of the Marial Bai Agreement. One such dialogue took place in Western Bahr el-Ghazal in 2024, during which representatives from the communities hosting pastoralists called attention to poor enforcement of provisions in the agreement about compensating farmers for damage caused by migrating livestock and its disproportionate effect on women (UNMISS, 2024a).

9. Discussion & Conclusion

In this article, we explore how UN PKOs may negative feedback loop between climate change, governance, and intercommunal violence in conflict-affected settings. We begin by highlighting how climate change can disrupt the institutions underpinning effective CPR management. Without these institutions, groups that depend on CPRs like shared grazing lands have weaker incentives to cooperatively resolve disputes over resource access and use. Weak incentives for cooperation heighten the risk that intercommunal disputes over shared resources in conflict-affected settings escalate to violence. Thus, interventions capable of strengthening existing or facilitating the creation of new institutions for CPR management in conflict-affected settings are needed to dampen the effect of climate change on intercommunal violence. We describe how multidimensional UN PKOs can address this need, drawing on evidence from four operations in the Sudano-Sahelian zone that leverage their capacities for building infrastructure, deploying frequent local patrols, and mediating disputes when responding to intercommunal violence related to conflict over shared grazing resources.

We should emphasize the descriptive and exploratory nature of our analysis. The evidence we review reports declines in the risk of intercommunal violence in areas where UN PKOs engage in de facto CPR management. However, these reports are insufficient to conclude that UN PKOs cause reductions in climate-related intercommunal violence for several reasons. For one, the missions in our sample may be engaged in "blue-washing," or more frequently reporting successes than failures in their operational reports. Moreover, multidimensional UN PKOs' strategies to resolve disputes related to shared resources do not always succeed. For example, while some evidence suggests UNMISS's activities in spreading awareness about the Marial Bai Agreement have reduced farmer-herder conflict (Adie et al., 2021), a group of landowners impacted by the early arrival of pastoralists' livestock in Western Bahr el-Ghazal refused to sign a revised copy of the agreement in 2020 (UNMISS, 2020).

Systematically testing whether the activities we describe in this article reduce climate-related intercommunal violence is a necessary but ambitious goal for future research. One important step in testing the insights our descriptive analysis produces will be compiling more granular data on where and when UN PKOs deploy the kinds of activities this article highlights. For example, existing datasets use publicly available deployment maps to track where UN peacekeeping troops, police, and military observers are deployed (Cil et al., 2019; Hunnicutt & Nomikos, 2020). These datasets could additionally track which local

contingents of UN peacekeepers have the capacity required to deploy the activities we describe above, such as units of engineers who can assist with constructing infrastructure.

We also acknowledge that UN PKOs do and will continue to face significant challenges in peacefully resolving local disputes about CPRs in areas simultaneously impacted by conflict and climate change. For one, these disputes can become intractable when they are linked to regional or national struggles for power (Hansen, 2024). UN PKOs' commitment to impartiality may limit their ability to address the grievances elites use to instigate intercommunal violence (Nomikos & Villa, 2022). Similarly, multidimensional UN PKOs may not be perceived as impartial actors by groups disputing access to shared resources. Recent work criticizes the state-centric nature of multidimensional UN PKOs (Autesserre, 2010, 2014; Howard, 2019). It is possible these critiques extend to UN PKOs' work on natural resource management. If political elites actively link local resource disputes to broader power struggles, and if UN PKOs are perceived to favor certain actors in those struggles, then the actions UN PKOs undertake locally to strengthen CPR management may violate Ostrom's seventh design principle, minimal recognition of rights to organize. As much suggests that our insights only apply to settings where PKOs enjoy greater legitimacy than other state actors (Nomikos, 2025).

The above limitations notwithstanding, our analysis contributes to the practice and study of peacebuilding in the context of global climate change. Only recently have international organizations begun addressing the challenges of sustaining climate adaptation and mitigation in conflict-affected settings. Current policies, such as the Relief Recovery and Peace Act resulting from the 28th Council of Parties of the United Nations Framework for the Convention on Climate Change, focus on closing funding gaps for conflict-sensitive climate programs (COP 28, 2020). Yet how this funding will be applied remains unclear, in part because we have not fully conceptualized how conflict mitigation itself can be adapted to reduce climate vulnerability and promote adaptation (Abrahams & Ober, 2024). Extant research suggests that programs can simultaneously address climate and conflict risks when they focus on strengthening local governance structures (Ide, 2017; Ide et al., 2021; Johnson et al., 2021, 2023; Kurtz & Elsamahi, 2023). Our study demonstrates how UN PKOs may work toward this goal, providing some rationale for why some experts believe UN PKOs can moderate the effect of climate change on conflict (Mach et al., 2019).

While our primary aim has been to identify and describe how UN PKOs may strengthen CPR governance in climate-affected conflict settings, our findings also speak to a broader set of potential co-benefits for climate adaptation. By reducing intercommunal violence through activities such as building infrastructure, patrolling contested areas, and mediating disputes, peacekeepers may indirectly contribute to climate adaptation—enhancing local institutions' capacity to manage environmental stress and reducing vulnerability to future shocks. This perspective suggests that fulfilling core peacekeeping mandates may have positive spillover effects for climate adaptation, even in the absence of explicit environmental objectives. At the same time, UN peacekeeping carries important maladaptation risks. UN missions have at times strained local resources, contributed to environmental degradation, or disrupted local governance systems (Maertens & Shoshan, 2018). These dynamics may undermine the very institutions they seek to support, particularly if peacekeeping activities are not aligned with local needs or perceptions of legitimacy. Future research should explore both the adaptive and maladaptive consequences of peacekeeping interventions in climate-vulnerable contexts.

In sum, this study provides a foundation for future research on the intersection of climate change, natural resource governance, and international peacekeeping. By demonstrating that UN peacekeepers already engage in activities that may support CPR management, we open new avenues for studying the role of international organizations in climate adaptation. As climate change continues to reshape conflict dynamics worldwide, developing strategies to integrate environmental governance and peacebuilding will be essential for maintaining peace and stability in fragile regions.

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Data availability statement

Data used for analysis provided in this manuscript will be made available on the author's Harvard Dataverse page upon publication.

Notes

1. ND-GAIN accessed February 4, 2025. Countries: Chad, Central African Republic, Democratic Republic of Congo, Sudan, South Sudan, Mali, and Sierra Leone. Deployment numbers from Hunnicutt and Nomikos (2020).
2. See Benjaminsen and Ba (2009) for a description of this institutional evolution in Mali's inner Niger Delta.
3. Reports were accessed here for MINUSCA, here for MINUSMA, here for UNAMID, and here for UNMISS. We focus on reports published up until December 2024 because this is when our coding of reports began.

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Appendix 1

Referenced United Nations peacekeeping reports

Table A1. Report list.

Report label	UN document number	Date	Mission
A	S/2010/382	July 2010	UNAMID
B	S/2010/543	October 2010	UNAMID
C	S/2015/141	February 2015	UNAMID
D	S/2015/1030	December 2015	MINUSMA
E	S/2017/94	February 2017	MINUSCA
F	S/2017/1113	December 2017	UNAMID
G	S/2018/154	February 2018	UNAMID
H	S/2021/172	February 2021	UNMISS
I	S/2021/1117	January 2022	MINUSMA

Note. MINUSCA = United Nations Multidimensional Integrated Stabilization Mission in the Central African Republic; MINUSMA = United Nations Multidimensional Integrated Stabilization Mission in Mali; UNAMID = United Nations African Union Hybrid Mission in Darfur; UNMISS = United Nations Mission in South Sudan.