HFG RESEARCH AND POLICY IN BRIEF

The Impact of Climate Change on Conflict

VALLY KOUBI

MARCH 2025

HFG | HARRY FRANK GUGGENHEIM FOUNDATION

Executive Summary

Recent academic literature identifies two primary pathways through which climate change—driven by rising temperatures and climate-related events like droughts and floods—can contribute to conflict: direct and indirect pathways. The direct pathway links rising temperatures to higher aggression, which may escalate interpersonal violence such as crime. It also connects climate-induced scarcity of resources such as water and arable land to intergroup conflict due to increased competition for these vital resources.

The indirect pathway highlights how climate change exacerbates economic hardship and migration, heightening social tensions and potentially leading to political unrest, communal violence, or even civil conflict and civil war. Climate-induced economic disruptions, such as crop failures, food insecurity, and stagnating economic growth, can fuel rebellion, increase inequality, and erode government capacity, raising the risk of conflict. Conversely, strong institutions can mitigate these risks. Climate change is also expected to drive large-scale migration flows, potentially straining resources, increasing job competition, and deepening social divisions—factors that could spark conflict in the receiving areas, usually urban settings. While some studies link climate-induced migration to large-scale armed conflicts like the Syrian civil war, others suggest that migration may primarily amplify existing tensions and lead to political unrest, such as protests. Micro-level research suggests that migrants—particularly those who have experienced both short- and long-term climate events, such as floods and droughts, at their place of origin—are more likely to participate in political unrest advocating for migrant rights in their new urban environments.

In conclusion, while climate change is not the primary driver of conflict, it can exacerbate conflict risks, particularly in regions with weak governance, high inequality, and political instability. As extreme weather events become more frequent, the risk of conflict is likely to rise, driven by their effects on economic stability, agriculture, and migration. To mitigate these risks, strengthening political institutions, fostering social cohesion, and effectively managing migration will be crucial.

Introduction

In recent decades, the concept of security has evolved far beyond traditional military considerations of state sovereignty to encompass a wider range of issues, with environmental challenges becoming central. Increasingly, scholars and policymakers recognize that environmental pressures such as resource depletion, pollution, and ecosystem degradation can undermine societal stability and contribute to conflict. This expanded framework, known as "environmental security," highlights how stressors like resource scarcity, particularly in already fragile regions, can intensify social tensions and fuel instability.

Climate change has now emerged as one of the most pressing global challenges, with extensive effects across environmental, social, and political domains. While the environmental impacts of climate change—such as shifting weather patterns and rising sea levels—are well-documented (IPCC 2022), there is growing concern that these changes may also deepen social tensions and lead to various forms of conflict. Prominent leaders, including former US President Barack Obama and former UN Secretary-General Ban Ki-moon, have cautioned that climate change poses a serious threat to global peace and stability. For example, shifting weather patterns can lead to water shortages and crop failures, intensifying tensions in already vulnerable regions and increasing the likelihood of violent conflict. The conflicts in Darfur and around the Lake Chad basin are frequently cited as prominent examples of tensions exacerbated by climate-related stressors. Security experts warn that without proactive efforts to address both the causes and impacts of climate change, competition over dwindling resources could increasingly escalate into conflict, especially in developing nations with limited capacity to adapt.

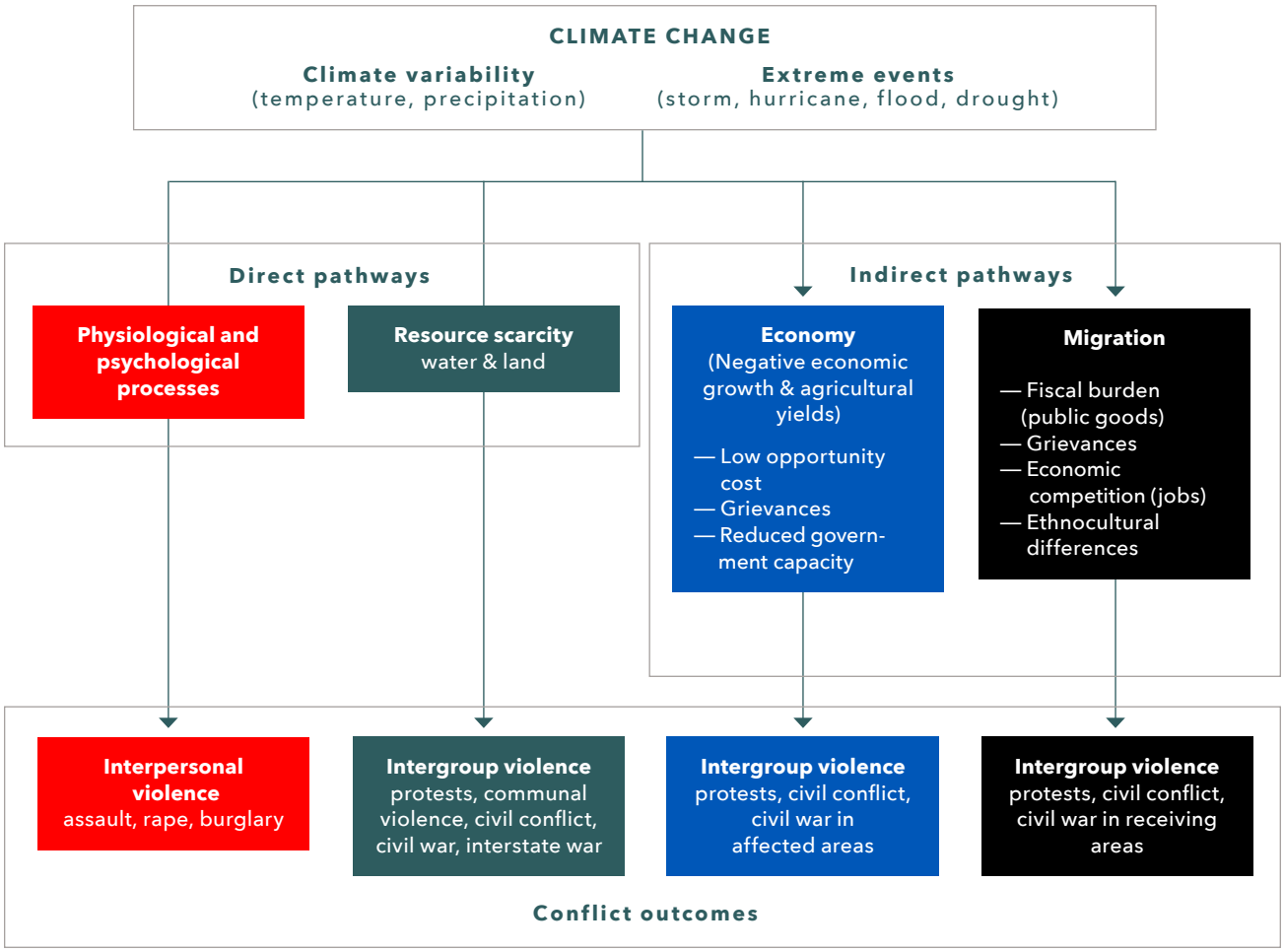
In this brief, I present a comprehensive review of recent literature linking climate change to conflict.[1] It focuses on climate variability—that is, short-term climate fluctuations, such as variations in temperature, precipitation, and extreme weather events (droughts, floods, storms)—given that only a few studies have examined the effects of long-term shifts in global temperatures and climate patterns. It also delves into potential causal pathways linking climate change to violent conflict. The debate on the climate-conflict nexus remains divided: some researchers argue for a direct causal relationship, contending that climate-driven resource scarcity and competition over water and arable land create fertile ground for violence. Other scholars propose a more nuanced perspective, viewing climate change as a "threat multiplier" that indirectly raises the risk of conflict by triggering economic

1 Some of the analysis of academic literature on the climate change–conflict nexus is based on insights from my review essay published in the *Annual Review of Political Science* (Koubi 2019).

disruptions, decreasing agricultural productivity, and spurring migration. While these climate-driven pressures do not inevitably cause violence, they create conditions that elevate conflict risk, with outcomes ultimately determined by countries' socioeconomic and political conditions. In addition to outlining these pathways, this review explores deeper causal mechanisms that may explain climate-driven conflict, including low opportunity cost of rebellion, socioeconomic and political grievances, and state weakness. By synthesizing insights from diverse theoretical and empirical studies, this brief offers a comprehensive analysis of how climate change may influence various types of conflict, from interpersonal violence and communal disputes to protests, civil conflict, and even interstate wars. First, I examine how climate might directly influence conflict outcomes, along with the critiques of this putative "direct pathway." Next, I explore the indirect pathway, which is strongly supported by empirical evidence. I conclude with several key insights about the complex relationship between climate change and conflict.

From climate change to conflict

The research literature identifies two primary origins for climate-linked conflict: climate change–related stressors (such as increased temperatures, altered precipitation patterns, and rising sea levels) and climate-related events (natural hazards such as floods, droughts, storms, and hurricanes) (Helman et al. 2020). From here, research diverges into two main branches: one examining a direct, single-step pathway to conflict and the other exploring an indirect, multi-step pathway. The direct pathway typically links climate stressors to individual-level violence, such as violent crime, and to intergroup conflict at national and international levels driven by competition for limited resources. In contrast, the indirect pathway emphasizes how climate-induced economic insecurity and migration can lead to a spectrum of intergroup conflicts—from lower-level social unrest, like protests, strikes, and riots, to communal violence, civil conflict (defined as involving at least twenty-five battle-related deaths), full-scale civil war (exceeding one thousand battle-related deaths), and even interstate war (conflict between sovereign nations). Figure 1 illustrates the two principal pathways through which climate change could contribute to conflict, outlining the core causal mechanisms that drive this relationship and shape various conflict outcomes.



Direct pathways

A direct link between climate change and conflict is supported by the temperature-aggression hypothesis, suggesting that rising ambient temperatures due to climate change may lead to increased *interpersonal violence* through physiological and psychological processes (Miles-Novelo and Anderson 2019). The physiological mechanism proposes that high temperatures activate brain regions associated with thermoregulation and emotion control, raising adrenaline levels, which may increase aggression, especially under provocation. Meanwhile, the psychological perspective of embodied cognition suggests that environmental factors like heat shape our thoughts and perceptions; in this case, heat-induced discomfort may lead to irritability and hostile perceptions of others, fueling aggressive behavior. Empirical studies support a positive link between temperature and various forms of interpersonal violence, including homicide, assault, rape, burglary, aggression during sports events, horn-honking, and even killings by drug-trafficking organizations (e.g., Baysan et al. 2019; Krenzer and Splan 2018; Mares and Moffetti 2016). For instance, Krenzer and Splan (2018) analyzed data from 38,870 Major League Baseball games from 2000 to 2015, controlling for temporal and social factors. They found that aggression was more likely on hotter days, with batters more often hit by pitches during uncomfortably hot games—even after accounting for factors such as pitcher effectiveness and game importance. However, because climate change produces gradual, long-term temperature shifts, it is essential to assess its effects on crime trends across years rather than within individual years. A recent study examining the climate-temperature-conflict hypothesis across fifteen large US cities over fourteen years found that 94 percent of temperature-crime correlations were statistically insignificant, challenging the idea of a straightforward link between climate change and crime (Lynch et al. 2022).

The second direct pathway linking climate change to conflict posits that climate-induced resource scarcity fuels *intergroup conflict* both within and between nations. This scarcity mainly impacts renewable resources—such as fresh water, arable land, forests, and fisheries—that are essential for human survival and economic stability. This argument is rooted in a neo-Malthusian perspective, expanding on Thomas Malthus's eighteenth-century theory that unchecked population growth would outpace food production, leading to shortages and conflict. Neo-Malthusians apply this idea to today's context, arguing that population pressures combined with adverse climate conditions—like high temperatures, prolonged droughts, and erratic rainfall—deplete critical resources and intensify competition over them, especially in regions already facing environmental stress and rapid population growth, thereby increasing the likelihood of conflict (Homer-Dixon 2001). Rising temperatures and diminishing rainfall reduce the availability of water and arable land, leading to heightened resource scarcity and motivating groups to protect their interests, which can

create tensions and conflict between groups relying on shared resources. This dynamic is evident in regions like Africa's Sahel, where climate variability has intensified competition for water and grazing land between sedentary farmers who cultivate crops and pastoralist herders who migrate seasonally with livestock (McGuirk and Nunn 2024; Adams et al. 2023; Eberle et al. 2020). For example, Eberle et al. (2020) found that a 1°C rise in temperature increases the likelihood of conflict by 54 percent in areas where farmers and herders coexist, compared to a 17 percent increase in areas without such overlap. Recent research also shows that warmer ocean temperatures off East Africa, which decrease fish production in that region, are associated with increased piracy, as fishermen seek alternative income, but a decrease in piracy in the South China Sea, as warmer temperatures in that area increase fish production (Jiang and LaFree 2023).

Since the late 2000s, advancements in high-resolution climate and conflict datasets—such as CRU TS3.10, SPEI, EM-DAT for climate data, and UCDP GED and ACLED for conflict data—have enabled extensive research into the links between climate variations and conflict. However, findings are mixed. While some studies associate rising temperatures, drought, and floods with higher conflict risks (von Uexkull et al. 2023; Almer et al. 2017; Breckner and Sunde 2019; Ghimire and Ferreira 2016), others find little evidence of such connections (Nardulli et al. 2015), with some research even suggesting that natural hazards may temporarily reduce violence if government or international aid undermines rebel support (Walch 2018). A key meta-analysis of sixty studies even quantified this link, finding a 14 percent increase in intergroup conflict per 1°C rise (Hsiang et al. 2013), though critics caution that such assessments may oversimplify the interplay of socioeconomic and governance-related factors, leading to an overstated impact of temperature on conflict dynamics (Buhaug et al. 2014). Strong evidence suggests that climatic changes are more likely to incite or intensify conflict in countries with weak political institutions, low social/political trust, ethnic or religious divisions, political marginalization, limited public goods provision, or low human development (Jansesberger 2024; Sarbahi and Koren 2022; Ide et al. 2020, 2021; Cao et al. 2020; Petrova 2022; von Uexkull et al. 2016; von Uexkull 2014; Böhmelt et al. 2014).

Transboundary water resources, essential for drinking, agriculture, and industry, are particularly vulnerable to the impacts of climate change. As climate disruptions affect the availability and flow of these shared waters, competition among dependent countries intensifies, escalating political tensions and raising the risk of conflict. A prominent example is the Nile River, which has long been a source of tension between Egypt, Sudan, and Ethiopia. Egypt, which relies on the Nile for 90 percent of its fresh water, is concerned that Ethiopia's Grand Renaissance Dam will reduce downstream water availability during droughts, exacerbating regional disputes. Similarly, tensions over water resources are evident in the Indus River Basin, shared by Pakistan and India, and the Euphrates–Tigris River

system, shared by Turkey, Syria, and Iraq. Climate shifts, including reduced rainfall and rising temperatures, coupled with unilateral infrastructure projects, further heighten tensions in regions lacking effective frameworks for managing shared resources (De Stefano et al. 2017). Despite these pressures, historical evidence suggests that countries often find ways to cooperate over shared water, challenging the narrative of inevitable "water wars" (Turgul et al. 2024). Many nations have established water-sharing agreements, such as the Nile Basin Initiative, to foster collaboration. While climate change presents new challenges, it also offers an opportunity to strengthen resource-sharing institutions, adapt management strategies, and pursue sustainable, peaceful solutions to water scarcity (Bernauer & Böhmelt 2020).

In summary, the argument that resource scarcity is a primary driver of conflict remains highly contentious and has sparked a significant body of critical scholarly literature. One of the key critiques of this mechanism is its deterministic nature, which suggests that individuals and communities are powerless to manage climate-induced scarcity through peaceful means, such as adaptive strategies, negotiation, market mechanisms, technological innovation, and cooperation (Raleigh et al. 2014). Another important critique is that conflict can arise even in areas with abundant resources, indicating that it is not only scarcity that can increase the risk of conflict. For example, when climatic changes *increase* renewable resources, such as during rainy seasons in semi-arid regions like the Sahel, competition for these resources can intensify. Violent events, such as cattle raiding and civilian attacks, are more likely during periods of higher rainfall, which supports healthier livestock and more abundant pasture, heightening competition among individuals and groups seeking to secure livelihoods (Raleigh and Kniveton 2012). State forces, rebel groups, and militias may also target these resources to bolster their ranks (Koren and Schon 2023). In northeastern Nigeria, for instance, Boko Haram has attacked farmers to control vital resources for consumption or sale (Eke-Okocha and Eze 2023). Some scholars argue that violence among pastoralist communities may actually increase with higher rainfall since it washes away tracks left by raiders and the denser vegetation provides cover, offering strategic advantages to those seizing resources (Detges 2014). Furthermore, resource abundance in the Arctic could also escalate interstate conflict. As Arctic ice melts, revealing resource-rich areas, competition among nations intensifies. Resource-dependent states, such as Russia and Norway, are particularly motivated to secure these assets, prompting both autocracies and democracies to assert territorial claims in the region. This evolving Arctic landscape could increase interstate tensions, especially if collaborative frameworks fail to address these developments or resolve disputes (Markowitz 2023). Together, these critiques, along with mixed empirical findings, challenge the oversimplified notion that climate-induced resource scarcity directly triggers conflict. The 6th Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) (2022) strengthens this skepticism, asserting that no direct connection exists between climate change and

conflict. The report emphasizes the lack of consensus among scholars regarding a causal link and highlights the need to consider a wider range of social, economic, and political factors. Additionally, the report underscores the importance of indirect pathways and complex interactions, advocating for a more nuanced and multidimensional approach to understanding the relationship between climate change and conflict.

Indirect pathways

Turning to the indirect pathways, most existing research indicates that the impact of climate change on conflict primarily occurs through its effects on economic hardship and migration.

ECONOMIC HARDSHIP

Adverse climate conditions hinder economic growth (Tol 2024), lower agricultural output, increase food insecurity, create price instability for essential goods, and undermine a government's ability to support and protect its citizens, ultimately contributing to conflict. These pathways linking climate-induced economic shocks to conflict can be understood through three main mechanisms: the low opportunity cost of rebellion, heightened inequality and grievances, and reduced government capacity.

Low opportunity cost of rebellion

Climate change, by lowering economic and agricultural incomes and reducing future prospects and by increasing food insecurity, decreases the opportunity cost of rebellion (i.e., creates a situation where there's less to lose), making conflict more probable (Burke et al. 2015). When peaceful employment options such as farming become less profitable, individuals are more likely to accept incentives offered by rebel leaders, increasing their willingness to join insurgent groups that fuel civil conflict and civil war (Chassang and Padro-i-Miguel 2009). Moreover, the desperation that comes with food insecurity reduces the perceived risks of participating in lower levels of social unrest, i.e., demonstrations, protests, or riots, making them seem a preferable alternative to the inability to feed oneself or one's family.

Heightened inequality and grievances

Global warming has worsened economic inequality both between and within countries (Diffenbaugh and Burke 2019). Poorer nations and vulnerable groups within nations—such as rural and agricultural households directly reliant on climate-sensitive livelihoods and minorities burdened by systemic inequalities like lower incomes, inadequate infrastructure, and limited access to healthcare—are disproportionately impacted by rising temperatures, variable precipitation patterns, and natural hazards. Economic shocks from climate change can exacerbate both real and perceived economic and political inequalities, fueling grievances that motivate individuals and groups to demand redistribution of resources and power, thereby increasing the likelihood of conflict (Cederman et al. 2013). This dynamic is especially strong in societies where climate change's adverse economic effects deepen existing divides, such as those based on ethnicity or class.

Reduced government capacity

Climate-related reductions in economic output shrink government resources, including tax revenues, which hampers the state's ability to deliver services, create economic opportunities, and suppress dissent. This weakened governance creates conditions in which armed opposition groups see an opportunity to challenge the state and initiate conflict (Fearon and Laitin 2003).

Empirical evidence for the economic hardship pathway

Given the potential for climate change to drive conflict by lowering the opportunity cost of rebellion—through reduced economic growth, declining agricultural income, and food insecurity—while also undermining state capacity, scholars have increasingly turned to empirical analysis to test these causal mechanisms.

Economic growth

Economic stress could be related to conflict not just because economic downturns cause conflict but also because economic downturns can themselves be caused by conflict. To assess whether and how much climate affects conflict through its effect on the economy, several large-N quantitative studies examine this indirect link by using climate variables like precipitation, temperature, and natural hazards as "instruments" for economic stress, that is, as variables that can cause economic stress but can't themselves be affected by conflict. This approach rests on the assumption that climate affects conflict risk exclusively through its adverse impacts on economic conditions, such as lower economic growth, which are widely considered strong predictors of civil unrest and war. Subsequent research has raised concerns about the validity of this approach due to the other possible pathways, such as migration, connecting climate to conflict (Sarsons 2015). However, findings are mixed: some studies indicate that reduced rainfall stifles economic growth, thereby increasing conflict risk, but are unable to distinguish between the mechanisms (Miguel et al. 2004). Conversely, other studies find no significant connection (Van Weezel 2015). Crucially, whether climate-driven economic stress translates into conflict appears to depend on contextual factors. Countries with authoritarian regimes (Koubi et al. 2012) or those with high ethnic diversity and marginalized populations (Wischnath and Buhaug 2014) are more susceptible to conflict under climate-related economic strain. These findings suggest that while climate variables help illuminate economic drivers of conflict, the likelihood of conflict is heavily influenced by a country's political and social vulnerabilities.

Agriculture

Agriculture, due to its high sensitivity to climate variations, is a central focus in the literature examining the climate-conflict nexus. Numerous studies spanning several centuries have shown that climate, when it has reduced agricultural yields, has contributed to conflict. For instance, cooler temperatures are linked to conflict in the Northern Hemisphere (Zang et al. 2011), and drought-induced agricultural losses have incited unrest in historic China (Jia 2014). Recent studies continue to support this relationship, demonstrating that reductions in agricultural output and income due to unfavorable climatic conditions are associated with various types of conflict—including riots, communal violence, and civil conflict—in regions like Africa and Asia (e.g., Von Uexkull et al. 2016), and individual countries like India (Sarsons 2015), the Philippines (Eastin 2018), and Somalia (Maystadt and Ecker 2014). A study using global gridded data for the 1982–2015 period reveals that the combined effect of climate extremes and crop production concentration among four main crops (maize, wheat, soybean, rice) increases the predicted probability of conflict onset by as much as 14 percent in agriculturally dependent countries (Vesco et al. 2021). Additional research emphasizes the impact of temperature and precipitation anomalies during crucial crop-growing seasons. Harari and La Ferrara (2018) show that droughts in agricultural regions of forty-eight African countries from 1997 to 2011 significantly increased the incidence of conflict, including civil conflict and rebel activities such as recruitment and the establishment of operational headquarters. Using various models and emissions scenarios, their analysis predicts that droughts during growing seasons will become 5.4 times more severe over the next thirty-five years, leading to a projected average increase of 7 percent in conflict incidence. Additionally, climatic stressors during these crucial periods have been shown to reduce rice yields in Indonesia (Caruso et al. 2016), maize production in sub-Saharan Africa (Jun 2017), and staple crops in the Philippines (Crost et al. 2018), all of which are associated with a heightened risk of civil conflict by exacerbating economic hardship, thereby lowering the opportunity cost of rebellion. Notably, the impact of these weather shocks on conflict dynamics appears to be intensified by ethnic divisions and low state capacity.

Food prices

Adverse climatic conditions, by reducing crop yields, also drive up food prices. While some smallholder farmers and farm laborers may benefit from higher prices and wages, increased food costs generally worsen food insecurity, especially for the urban poor, who lack affordable alternatives, and many rural residents who are net food consumers, that is, who buy more food than they sell (McGuirk and Burke 2020). Higher food prices can make basic necessities unaffordable for vulnerable populations, often leading to social unrest and violence (Bellemare

2015; Hendrix et al. 2015). Historical events illustrate the impact of climate-driven food price spikes on social stability. For instance, the sharp rise in food prices during the 2007–2008 crisis sparked "food riots" across several African nations (Berazneva et al. 2013) and was one of the factors contributing to unrest in parts of the Arab Spring (Soffiantini 2020). A recent study using geolocated Twitter data from urban areas in Kenya and employing a supervised machine learning approach to classify both English- and Swahili-language tweets about food and water insecurity finds that food and water insecurities are mutually reinforcing in driving citizens to protest, rather than acting as separate, independent factors (Koren et al. 2021). Further research indicates that domestic food price surges—often triggered by international climate-related shocks—tend to increase the risk of social unrest (Smith 2014; Raleigh et al. 2015). Notable examples include riots in Mozambique and Egypt, where food prices spiked following climate disruptions abroad, such as droughts in Russia and extensive flooding in parts of Asia, which impacted global grain markets and drove up prices worldwide (Hunt et al. 2021). Such cases underscore the interconnectedness of global agricultural markets and show how climate events in one region can have far-reaching effects, destabilizing food security and social cohesion in other parts of the world.

Weakened governments

Natural hazards can weaken governments, thereby increasing both the likelihood and duration of conflict. These disasters force governments to redirect resources and security forces to disaster response efforts, reducing their capacity to address insurgent threats. This creates opportunities for insurgent violence to rise as armed groups exploit power vacuums (Ide 2023). Terrorism in particular tends to increase as security forces are stretched thin, leaving certain targets more vulnerable (Berrebi and Ostwald 2013). Additionally, ineffective or unequal disaster responses can erode public support, especially among marginalized communities, heightening the risk of civil unrest (Berrebi and Ostwald 2011). Weakened governments facing natural hazards are also more likely to escalate repression in response, as the combination of rising grievances and diminishing state control creates an opening for dissident groups to mobilize and challenge state authority, thus raising the risk of conflict (Wood and Wright 2016). Moreover, a government weakened by a disaster struggles to resolve ongoing conflicts, as rebels can exploit compromised infrastructure and defenses, potentially prolonging civil wars (Eastin 2016). Empirical studies support the connection between natural hazards and the onset and duration of civil conflict (e.g., Ide 2023; Rahman et al. 2022; Eastin 2016).

Overall, the findings suggest that while climate-induced economic challenges can heighten conflict risk, a country's political and social resilience is critical. Weak governance, social inequality, and political marginalization make countries more susceptible to conflict in the face of economic shocks,

whereas strong institutions and social cohesion can help buffer against these risks. A recent study synthesizing the assessments of numerous experts supports this perspective, making the case that although climate has influenced armed conflict in recent decades, factors like low socioeconomic development, poor governance, inequality, and a history of violence have been "substantially more influential" in driving conflict (Mach et al. 2019). However, as climate change accelerates and extreme events grow more frequent, conflict risks are expected to increase due to impacts on economic stability, agricultural production, intergroup disparities, and migration (von Uexkull and Buhaug 2021). The interplay between conflict, climate hazards, and vulnerability creates a self-reinforcing cycle, where climate-related impacts and conflicts amplify societies' vulnerabilities to future climate threats, trapping them in a cycle of escalating violence and worsening climate impacts (Buhaug and von Uexkull 2021).

MIGRATION

Climate change is expected to drive increased migration among vulnerable populations (IPCC 2022), with the World Bank's *Groundswell* report projecting up to 216 million displaced people by 2050 under high-emissions scenarios and uneven development (Clement et al. 2021). This anticipated rise in displacement fuels the ongoing debate about the connection between climate change and security risks. While policymakers often view climate migration as a clear threat, academic perspectives on the issue remain diverse. Theoretical models linking environmental migration to conflict often draw on the conflict-refugee literature, suggesting that the arrival of environmentally displaced people in receiving areas can strain local resources. This competition for jobs and social services between natives and migrants can exacerbate inequalities, grievances,
and social tensions, potentially leading to conflict. For instance, Boustan et al. (2010) found that climate-induced migration during the American Dust Bowl of the 1930s triggered protests, with locals in receiving areas accusing migrants of taking jobs, lowering wages, and overloading relief systems. Moreover, migrants experiencing economic and social marginalization may develop grievances, potentially increasing the likelihood of violent reactions (Cederman et al. 2013). Finally, environmental migration can exacerbate ethnic tensions, particularly when migrants and local residents belong to different ethnic groups, thereby upsetting a delicate ethnic balance (Gaikwad and Nellis 2017).

Empirical evidence for the migration pathway

Despite a growing number of studies examining the potential link between environmental change, migration, and conflict, there remains little consensus on this relationship. Some researchers provide evidence that large-scale population movements caused by climate shocks played a significant role in triggering Syria's uprising and subsequent civil war (e.g., Ash and Obradovich 2020; Kelley et al. 2015). Conversely, others argue that the drought had minimal, if any, influence (Selby et al. 2017).

Additionally, empirical findings from large-scale studies are often limited and ambiguous, complicating efforts to draw clear conclusions. For instance, some studies suggest that environmental migration increases violence in Darfur (De Juan 2015) and rioting in parts of India where local populations lack political alignment with the central government (Bhavnani and Lacina 2015). Other research finds that flood-induced migration tends to exacerbate existing conflicts rather than incite new ones (Ghimire et al. 2015) and does not increase the frequency of protests in migrant-receiving regions in Bangladesh (Petrova 2021). Recent studies indicate that climate-induced migration may raise the likelihood of conflict initiation by destination countries against origin countries, with this relationship influenced by origin-country characteristics, migration flow dynamics, and climate variables such as extreme temperatures, drought, and flooding (Cattaneo and Foreman 2023).

While these studies highlight the complex relationship between climate, migration, and conflict, they often rely on aggregated data at the country, regional, or community level, which can lead to imprecise conclusions. This is due to the challenge of isolating the impact of environmental change from other factors influencing conflict, such as economic and political issues. And a key difficulty in studying the effects of environmentally induced migration is distinguishing its specific impact. Recent studies using micro-level data indicate that migrants who have been affected by sudden climate events, like floods in their place of origin, are more likely to self-identify as environmental migrants than those who've endured long-term climate events, such as droughts (Nguyen et al. 2024). These latter migrants tend to report higher perceptions of discrimination and conflict in the urban areas they relocate to (Koubi et al. 2018). However, this does not generally correlate with increased support for violence, except among short-term migrants who have directly experienced violence themselves (Linke et al. 2018). Furthermore, there is some evidence suggesting that climate-induced migration can increase the potential for urban social unrest. For instance, individuals who have experienced both sudden and gradual climate events, such as droughts and floods, in their place of origin are more likely to join and participate in social movements, including protests with the potential for violence, in support of migrant rights in Kenya (Koubi et al. 2021). Furthermore, urban residents' views on environmental migrants appear to be strongly influenced by their own economic interests. Urban residents in Kenya and Vietnam do not view environmental factors as the primary or most legitimate reason for migration. Consequently, they are less likely to recognize environmental migration as a form of involuntary migration deserving protection. Unlike findings about Europe and the United States, research suggests that these urban populations are not primarily influenced by humanitarian concerns, which makes them less receptive to welcoming environmental migrants into their cities (Spilker et al. 2020). This, coupled with the finding that environmental migrants are more likely to participate in social movements for migrant rights, suggests that environmental migration may contribute to political unrest, i.e., low levels of conflict, such as demonstrations, protests, or riots, in their new urban settings.

Key takeaways

There is no robust empirical evidence that climate change directly triggers intergroup conflict through competition over scarce resources. However, higher temperature has been shown to increase aggression and contribute to higher rates of interpersonal violence.

Climate change can fuel intergroup conflict by creating periods of resource abundance that intensify competition among groups and nations seeking to claim these newly accessible resources.

Climate change can increase the risk of conflict via economic hardship and migration, particularly in contexts already marked by political, economic, and social vulnerabilities, by lowering the opportunity cost of engaging in rebellion, heightening grievances, or hindering a government's capacity to protect and provide for its people.

A reinforcing feedback loop between climate change, vulnerability, and conflict suggests that anthropogenic warming will likely amplify these risks in the future.

Directions for future research

This literature review highlights several critical areas for future research to better understand the complex relationship between climate change and armed conflict. To inform effective interventions and risk-management strategies, future studies should explore the following topics:

Expanding the focus: from conflict to cooperation in climate-related responses

The academic literature on climate change and conflict has predominantly focused on violent armed conflict, with growing attention from defense and foreign policy communities concerned about its security implications. However, cooperative responses to climate-related challenges are arguably more common than violent outcomes and warrant greater scholarly focus. To better understand how to promote peaceful, collaborative responses to climate hazards, future research must examine the full spectrum of outcomes—from conflict to cooperation—highlighting the conditions that facilitate resilience and collaborative solutions in the face of environmental stressors.

Unpacking mechanisms linking climate and conflict

Future research should explore how climate change triggers conflict, as current evidence remains inconclusive. Key mechanisms—such as lowered opportunity costs for rebellion, heightened grievances, and weakened state capacity—require deeper investigation, especially since different contexts may activate different drivers. Understanding why climate triggers conflict is crucial for designing effective policies to prevent conflict under adverse climatic conditions. A mixed-methods approach, combining qualitative case studies with quantitative analyses, can provide both context-specific insights and broader patterns, offering a more comprehensive understanding of the climate-conflict nexus.

The roles of economic development, governance, and political stability

Research should explore how economic development, governance structures, and political stability mediate the relationship between climate change and conflict. Comparative studies analyzing countries with robust economic and political institutions versus those with weaker frameworks could offer valuable insights into how adaptive governance practices enhance societal resilience. Such research could also examine how governance failures exacerbate vulnerabilities, contributing to conflict in the context of climate-induced resource pressures and migration-related tensions.

Micro-level impacts of climate events on migration and conflict

Future studies should conduct micro-level investigations into how experiences of specific climate events—such as floods, droughts, and hurricanes—influence migrants' ability to adjust and integrate into their new environments. This research should assess the social dynamics in receiving areas, focusing on migrants' social integration, perceptions of discrimination, and susceptibility to conflict. By identifying these localized dynamics, policymakers and practitioners can better design programs that promote social cohesion and reduce conflict risks in host communities.

Transitioning to clean energy and its conflict implications

Another critical area for future research is the impact on civil conflict risks of transitioning from fossil fuels to clean energy technologies. This research should assess the domestic and geopolitical implications of shifting away from traditional conflict-prone resources like oil and gas toward minerals needed for clean-energy technologies, such as lithium, cobalt, and rare earth elements. Given that these minerals are concentrated in a limited number of countries, it is essential to investigate whether their extraction and trade could fuel new forms of resource-based conflict. Additionally, research should examine how global competition for these resources may influence regional stability, governance challenges, and international security dynamics in resource-rich nations.

Policy recommendations for addressing climate change, migration, and conflict

To address the complex interplay between climate change, migration, and conflict, the following policy recommendations focus on promoting sustainable development, fostering social cohesion, and enhancing regional and international cooperation.

Promote sustainable agriculture, strengthen social safety nets, and foster economic diversification.

National leaders, particularly in the Global South, should prioritize agriculture, forestry, and fisheries as key sectors in their national development strategies. Sustainable agriculture must be central to addressing climate change, economic growth, migration, and conflict, as it enhances climate resilience while tackling root causes of instability such as rural poverty, food insecurity, and inequality. Achieving sustainable production regimes requires robust global partnerships, including financial support through mechanisms like the Green Climate Fund, technology transfer, and capacity building to facilitate the widespread adoption of sustainable practices. Additionally, to mitigate the economic vulnerabilities intensified by climate change, policies should focus on expanding social safety nets and diversifying local economies. Providing alternative livelihoods can reduce economic pressures that often lead to social unrest and conflict.

Implement conflict-sensitive migration policies and foster public awareness.

Policymakers must develop conflict-sensitive migration policies that address both the risks and opportunities of climate-induced migration. These policies should ensure migrants have access to essential services, promote social cohesion, and facilitate integration into host communities to prevent resource-based tensions from escalating into conflict. Public awareness campaigns are equally critical, as they can shift perceptions of climate migrants from threats to vulnerable individuals in need of support. International humanitarian organizations should play a key role in safeguarding the rights of climate migrants, providing protection and assistance.

Enhance regional cooperation on shared resources.

In regions where countries share critical natural resources, such as the Nile River or the Lake Chad Basin, strengthening regional cooperation is essential to preventing resource-based conflicts exacerbated by climate change. Multilateral agreements on resource management and climate adaptation

can promote equitable resource use, reduce competition, and foster stability. Collaborative frameworks for managing shared resources can also enhance climate resilience and support sustainable development across borders.

Vally Koubi is a professor and senior scientist at the Center for Comparative and International Studies (CIS) at the Swiss Federal Institute of Technology Zurich (ETH Zurich) and a professor in the Department of Economics at the University of Bern. Her research explores the social and political dimensions of climate change, focusing on its effects on migration and conflict, particularly in developing regions. She also examines the drivers of domestic environmental policies and the dynamics of international environmental co-operation over time. Koubi earned her BA from the University of Athens, Greece, and her MS, MA, and PhD from the University of Rochester.

The Harry Frank Guggenheim Foundation acknowledges the efforts of **Eliane Shackleton** who, as Program Assistant, was instrumental in the conception and production of this publication.

References

Adams EA, A Thill, ED Kuusaana, and A Mittag. 2023. "Farmer–Herder Conflicts in Sub-Saharan Africa: Drivers, Impacts, and Resolution and Peacebuilding Strategies." Environmental Research Letters 18: 123001. https://doi.org/10.1088/1748-9326/ad0702.

Almer C, J Laurent-Lucchetti, and M Oechslin. 2017. "Water Scarcity and Rioting: Disaggregated Evidence from Sub-Saharan Africa." *Journal of Environmental Economics and Management* 86: 193–209. https://doi.org/10.1016/j.jeem.2017.06.002.

Ash K and N Obradovich. 2020. "Climatic Stress, Internal Migration, and Syrian Civil War Onset." *Journal of Conflict Resolution* 64 (1): 3–31. https://doi.org/10.1177/0022002719864140.

Baysan C, M Burke, F González, S Hsiang, and E Miguel. 2019. "Non-economic Factors in Violence: Evidence from Organized Crime, Suicides and Climate in Mexico." *Journal of Economic Behavior & Organization* 168: 434–452. https://doi.org/10.1016/j.jebo.2019.10.021.

Bellemare MF. 2015. "Rising Food Prices, Food Price Volatility, and Social Unrest." American *Journal of Agricultural Economics* 97 (1): 1–21. https://doi.org/10.1093/ajae/aau038.

Berazneva J and DR Lee. 2013. "Explaining the African Food Riots of 2007–2008: An Empirical Analysis. Food Policy 39: 28–39. https://doi.org/10.1016/j.foodpol.2012.12.007.

Bernauer T and T Böhmelt. 2020. "International Conflict and Cooperation over Freshwater Resources." *Nature Sustainability* 3 (5): 350–356. https://doi.org/10.1038/s41893-020-0479-8.

Berrebi C and J Ostwald. 2011. "Earthquakes, Hurricanes, and Terrorism: Do Natural Disasters Incite Terror?" *Public Choice* 149 (3/4): 383–403. https://doi.org/10.1007/s11127-011-9868-x.

Berrebi C and J Ostwald. 2013. "Exploiting the Chaos: Terrorist Target Choice Following Natural Disasters." *Southern Economic Journal* 79 (4): 793–811. https://doi.org/10.4284/0038-4038-2012.268.

Bhavnani RR and B Lacina. 2015. "The Effects of Weather-Induced Migration on Sons of the Soil Violence in India." *World Politics* 67: 760–794. http://www.jstor.org/stable/24578415.

Böhmelt T, T Bernauer, H Buhaug, NP Gleditsch, T Tribaldos, and G Wischnath. 2014. "Demand, Supply, and Restraint: Determinants of Domestic Water Conflict and Cooperation." *Global Environmental Change* 29: 337–4810. https://doi.org/1016/j.gloenvcha.2013.11.018.

Boustan LP, PV Fishback, and S Kantor. 2010. "The Effect of Internal Migration on Local Labor Markets: American Cities During the Great Depression." *Journal of Labor Economics* 28 (4): 719–746. https://doi.org/10.1086/653488.

Breckner M and U Sunde. 2019. "Temperature Extremes, Global Warming, and Armed Conflict: New Insights from High Rsolution Data." *World Development* 123: 04624. https://doi.org/10.1016/j.worlddev.2019.104624.

Buhaug H, J Nordkvelle, T Bernauer, et al. 2014. "One Effect to Rule Them All? A Comment on Climate and Conflict." Climatic Change 127: 391–397. https://doi.org/10.1007/s10584-014-1266-1.

Buhaug H and N von Uexkull. 2021. "Vicious Circles: Violence, Vulnerability, and Climate Change." *Annual Review of Environmental Resources* 46: 545–568. https://doi.org/10.1146/annurev-environ-012220-014708.

Burke M, SM Hsiang, and E Miguel. 2015. "Climate and Conflict." *Annual Review of Economics* 7 (1): 577–617. https://doi.org/10.1146/annurev-economics-080614-115430.

Cao X, T-I Gizelis, A Shortland, and H Urdal. 2020. "Drought, Local Public Goods, and Inter-communal Conflicts: Testing the Mediating Effects of Public Service Provisions." Defence and Peace Economics 33 (3): 259–279. https://doi.org/10.1080/10242694.2020.1855560.

Caruso R, I Petrarca, and R Ricciuti. 2016. "Climate Change, Rice Crops, and Violence: Evidence from Indonesia." *Journal of Peace Researc*h. 53: 66–83. http://www.jstor.org/stable/43920583.

Cattaneo C and T Foreman. 2023. "Climate Change, International Migration, and Interstate Conflicts." *Ecological Economics* 211: 107890. https://doi.org/10.1016/j.ecolecon.2023.107890.

Cederman LE, KS Gleditsch, and H Buhaug. 2013. *Inequality, Grievances, and Civil War.* Cambridge: Cambridge University Press.

Chassang S and G Padró i Miquel. 2009. "Economic Shocks and Civil War." *Quarterly Journal of Political Science* 4: 211–228. https://doi.org/10.1561/100.00008072.

Clement V, K Kumari Rigaud, A de Sherbinin, et al. 2021. "Groundswell Part 2: Acting on Internal Climate Migration." Report. World Bank, Washington, DC. https://openknowledge.worldbank.org/handle/10986/36248.

Crost B, C Duquennois, JH Felter, and DI Rees. 2018. "Climate Change, Agricultural Production and Civil Conflict: Evidence from the Philippines." Journal of Environmental Economics and Management 88: 379–395. https://doi.org/10.1016/j.jeem.2018.01.005.

De Juan A. 2015. "Long-Term Environmental Change and Geographical Patterns of Violence in Darfur, 2003–2005." *Political Geography* 45: 22–33. https://doi.org/10.1016/j.polgeo.2014.09.001.

De Stefano L, JD Petersen-Perlman, EA Sproles, J Eynard, and AT Wolf. 2017. "Assessment of Transboundary River Basins for Potential Hydro-Political Tensions." *Global Environmental. Change* 45: 35-46. https://doi.org/10.1016/j.gloenvcha.2017.04.008.

Detges A. 2014. "Close-up on Renewable Resources and Armed Conflict: The Spatial Logic of Pastoralist Violence in Northern Kenya." *Political Geography* 42: 57–65. https://doi.org/10.1016/j.polgeo.2014.06.003.

Diffenbaugh NS and M Burke. 2019. "Global Warming Has Increased Global Economic Inequality." *Proceedings of the National Academy of Sciences* 116 (20): 9808–9813. https://doi.org/10.1073/pnas.1816020116.

Eberle UJ, D Rohner, and M Thoenig. 2020. "Heat and Hate, Climate Security and Farmer-Herder Conflicts in Africa." Working Paper No. 22. Empirical Studies of Conflict Project (ESOC).

Eke-Okocha NP and CG Eze. 2023. "Boko Haram Insurgency in North-Eastern Nigeria, How Has This Influenced Food Insecurity in the Region?" In *Integrated Approaches to Peace and Sustainability*, edited by A Sharifi, D Simangan, and S Kaneko. Springer Nature, 2023. https://doi.org/10.1007/978-981-19-7295-9.

Eastin J. 2016. "Fuel to the Fire: Natural Disasters and the Duration of Civil Conflict." *International Interactions* 42 (2): 322–349. https://doi.org/10.1080/03050629.2016.1115402.

Eastin J. 2018. "Hell and High Water: Precipitation Shocks and Conflict Violence in the Philippines." *Political Geography* 63: 116–134. https://doi.org/10.1016/j.polgeo.2016.12.001.

Fearon JD and DD Laitin. 2003. "Ethnicity, Insurgency, and Civil War." *American Political Science Review* 97 (1): 75–90. https://doi.org/10.1017/S0003055403000534.

Gaikwad N and G Nellis. 2017. "The Majority-Minority Divide in Attitudes Toward Internal Migration: Evidence from Mumbai." American Journal of Political Science 61 (2): 456–472. https://doi.org/10.1111/ajps.12276.

Ghimire R and S Ferreira. 2016. "Floods and Armed Conflict." *Environment and Development Economics* 21 (1):23–52. https://doi.org/10.1017/S1355770X15000157.

Ghimire R, S Ferreira and JH Dorfman. 2015. "Flood-Induced Displacement and Civil Conflict." *World Development* 66: 614–628. https://doi.org/10.1016/j.worlddev.2014.09.021.

Harari M and E La Ferrara. 2018. "Conflict, Climate, and Cells: A Disaggregated Analysis." *The Review of Economics and Statistics* 100 (4): 594–608. https://doi.org/https://doi.org/10.1162/rest_a_00730. Helman D, BF Zaitchik, and C Funk. 2020. "Climate Has Contrasting Direct and Indirect Effects on Armed Conflicts." Environmental Research Letters 15: 104017. https://doi.org/10.1088/1748-9326/aba97d.

Hendrix C and S Haggard. 2015. "Global Food Prices, Regime Type, and Urban Unrest in the Developing World." *Journal of Peace Research* 52 (2): 143–157. https://doi.org/10.1177/0022343314561599.

Homer-Dixon TF. 2001. *Environment, Scarcity, and Violence*. Princeton University Press.

Hsiang SM, M Burke and E Miguel. 2013. "Quantifying the Influence of Climate on Human Conflict." Science 341: 1235367. https://doi.org/10.1126/science.1235367.

Hunt E, F Femia, C Werrell, et al. 2021. "Agricultural and Food Security Impacts from the 2010 Russia Flash Drought." *Weather and Climate Extremes* 34: 100383. https://doi.org/10.1016/j.wace.2021.100383.

Ide T. 2023. "Rise or Recede? How Climate Disasters Affect Armed Conflict Intensity." *International Security* 47 (4): 50–78. https://doi.org/10.1162/isec_a_00459.

Ide T, M Brzoska, JF Donges, and C-F Schleussner. 2020. "Multi-method Evidence for When and How Climate-Related Disasters Contribute to Armed Conflict Risk." *Global Environmental Change* 62: 102063. https://doi.org/10.1016/j.gloenvcha.2020.102063.

Ide T, A Kristensen, and H Bartusevičius. 2021. "First Comes the River, Then Comes the Conflict? A Qualitative Comparative Analysis of Flood-Related Political Unrest." *Journal of Peace Research* 58 (1): 83–97. https://doi.org/10.1177/00223433209667.

Intergovernmental Panel on Climate Change (IPCC). 2023: "Summary for Policymakers." In Climate Change 2022: *Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate*. Cambridge University Press. https://doi.org/10.1017/9781009325844.001.

Jansesberger V. 2024. "Sudden Weather Disasters as Triggers for Ethnic Protest in Autocracies?" *Political Geography* 113: 103163. https://doi.org/10.1016/j.polgeo.2024.103163.

Jia R. 2014. "Weather Shocks, Sweet Potatoes and Peasant Revolts in Historical China." *Economic Journal* 124: 92–118. https://doi.org/10.1111/ecoj.12037.

Jiang B and G LaFree. 2023. "Climate Change, Fish Production, and Maritime Piracy." *Weather, Climate, and Society* 15: 289–306. https://doi.org/10.1175/WCAS-D-21-0147.1.

Jun T. 2017. "Temperature, Maize Yield, and Civil Conflicts in Sub-Saharan Africa." *Climatic Change* 142: 183–197. https://doi.org/10.1007/s10584-017-1941-0.

Kelley CP, S Mohtadi, MA Cane, R Seager, and Y Kushnir. 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.

Koubi V. 2019. "Climate Change and Conflict." *Annual Review of Political Science* 22: 343–360. https://doi.org/10.1146/annurev-polisci-050317-070830.

Koubi V, T Bernauer, A Kalbhenn, and G Spilker. 2012. "Climate Variability, Economic Growth, and Conflict." *Journal of Peace Research* 49: 113–127. https://doi.org/10.1177/0022343311427173.

Koubi V, T Böhmelt, G Spilker, and L Schaffer. 2018. "The Determinants of Environmental Migrants' Conflict Perception." *International Organization* 72 (4): 905–936. https://www.jstor.org/stable/26569501.

Koubi V, Q Nguyen, G Spilker, and T Böhmelt. 2021. "Environmental Migrants and Social-Movement Participation. *Journal of Peace Research* 58 (1): 18–32. https://doi.org/https://doi.org/10.1177/0022343320972153.

Koren O, BE Bagozzi, and TS Benson. 2021. "Food and Water Insecurity as Causes of Social Unrest: Evidence from Geolocated Twitter Data." *Journal of Peace Research* 58 (1): 67–82. https://doi.org/10.1177/0022343320975091.

Koren O and J Schon. 2023. "Climate Change, Cash Crops, and Violence Against Civilians in the Sahel." *Regional Environmental Change* 23: 112. https://doi.org/10.1007/s10113-023-02090-7.

Krenzer WLD and ED Splan. 2018. "Evaluating the Heat–Aggression Hypothesis: The Role of Temporal and Social Factors in Predicting Baseball Related Aggression." *Aggressive Behavior* 44 (1): 83–88. https://doi.org/10.1002/ab.21726.

Linke A, FDW Witmer, J O'Loughlin, TJ McCabe, and J Tir. 2018. "The Consequences of Relocating in Response to Drought: Human Mobility and Conflict in Contemporary Kenya." *Environmental Research Letters* 13 (9): 094014. https://doi.org/10.1088/1748-9326/aad8cc.

Lynch MJ, PB Stretesky, MA Long, and KL Barrett. 2022. "The Climate Change-Temperature-Crime Hypothesis: Evidence from a Sample of 15 Large US Cities, 2002 to 2015." *International Journal of Offender Therapy and Comparative Criminology* 66 (4): 430–450. https://doi.org/10.1177/0306624X20969.

Mach KJ, CM Kraan, WN Adger, et al. 2019. "Climate as a Risk Factor for Armed Conflict." Nature 571: 193–197. https://doi.org/10.1038/s41586-019-1300-6.

Mares DM and KW Moffett. 2016. "Climate Change and Interpersonal Violence: A 'Global' Estimate and Regional Inequities." *Climatic Change* 135: 297–310. https://doi.org/10.1007/s10584-015-1566-0.

Markowitz JN. 2023. "Arctic Shock: Utilizing Climate Change to Test a Theory of Resource Competition." Journal of Conflict Resolution 67 (10): 1845–1872. https://doi.org/10.1177/00220027231153577.

Maystadt JF and O Ecker. 2014. "Extreme Weather and Civil War: Does Drought Fuel Conflict in Somalia Through Livestock Price Shocks?" *Am. J. Agric. Econ*. 96: 1157–1182. https://doi.org/10.1093/ajae/aau010.

McGuirk E and M Burke. 2020. "The Economic Origins of Conflict in Africa." *Journal of Political Economy* 128 (10): 3940–3997. https://doi.org/10.1086/709993.

McGuirk EF and N Nunn. 2024. "Transhumant Pastoralism, Climate Change, and Conflict in Africa." *The Review of Economic Studies* 92 (1): 404–441. https://doi.org/10.1093/restud/rdae027.

Miguel E, S Satyanath, and E Sergenti. 2004. "Economic Shocks and Civil Conflict: An Instrumental Variables Approach." Journal of Political Economy 112 (4): 725–753. https://doi.org/10.1086/421174.

Miles-Novelo A and CA Anderson. 2019. "Climate Change and Psychology: Effects of Rapid Global Warming on Violence and Aggression." *Current Climate Change Reports* 5: 36–46. https://doi.org/10.1007/s40641-019-00121-2.

Nardulli PF, B Peyton, and J Bajjalieh. 2015. "Climate Change and Civil Unrest: The Impact of Rapid-Onset Disasters." *Journal of Conflict Resolution* 59 (2): 310–335. https://doi.org/10.1177/0022002713503809.

Nguyen Q, G Spilker, V Koubi, and T Böhmelt. 2024. "How Sudden- Versus Slow-Onset Environmental Events Affect Self-Identification as an Environmental Migrant: Evidence from Vietnamese and Kenyan Survey Data." *PLoS One* 19 (1). https://doi.org/10.1371/journal.pone.0297079.

Petrova K. 2021. "Natural Hazards, Internal Migration and Protests in Bangladesh." *Journal of Peace Research* 58 (1): 33–49. https://doi.org/10.1177/0022343320973741.

Petrova K. 2022. "Floods, Communal Conflict and the Role of Local State Institutions in Sub-Saharan Africa." *Political Geography* 92. https://doi.org/10.1016/j.polgeo.2021.102511.

Rahman MH, N Anbarci, and MA Ulubaşoğlu. 2022. "'Storm Autocracies': Islands as Natural Experiments." *Journal of Development Economics* 159. https://doi.org/10.1016/j.jdeveco.2022.102982.

Raleigh C, HJ Choi, and D Kniveton. 2015. "The Devil Is in the Details: An Investigation of the Relationships Between Conflict, Food Price and Climate Across Africa." *Global Environmental Change-Human and Policy Dimensions* 32: 187–199. https://doi.org/10.1016/j.gloenvcha.2015.03.005.

Raleigh C and D Kniveton. 2012. "Come Rain or Shine: An Analysis of Conflict and Climate Variability in East Africa." *Journal of Peace Research* 49 (1): 51–64. https://doi.org/10.1177/002234331142775.

Raleigh C, A Linke, and J O'Loughlin. 2014. "Extreme Temperatures and Violence." *Nature Climate Change* 4: 76–77. https://doi.org/10.1038/nclimate2101.

Sarbahi A and O Koren. 2022. "The Moderating Effect of Democracy on Climate-Induced Social Conflict: Evidence from Indian Districts." *Political Research Quarterly* 75 (3): 892–905. https://doi.org/10.1177/10659129211034572.

Sarsons H. 2015. "Rainfall and Conflict: A Cautionary Tale." *Journal of Development Economics* 115: 62–72. https://doi.org/10.1016/j.jdeveco.2014.12.007.

Selby J, OS Dahi, C Fröhlich, and M Hulme. 2017. "Climate Change and the Syrian Civil War Revisited." *Political Geography* 60: 232–244. https://doi.org/10.1016/j.polgeo.2017.05.007.

Smith TG. 2014. "Feeding Unrest: Disentangling the Causal Relationship Between Food Price Shocks and Sociopolitical Conflict in Urban Africa." *Journal of Peace Research* 51 (6): 679–695. https://doi.org/10.1177/0022343314543722.

Soffiantini G. 2020. "Food Insecurity and Political Instability During the Arab Spring." *Global Food Security* 26 (1). https://doi.org/10.1016/j.gfs.2020.100400.

Spilker G, Q Nguyen, V Koubi, and T Böhmelt. 2020. "Attitudes of Urban Residents Towards Environmental Migration in Kenya and Vietnam." *Nature Climate Change* 10: 622–627. https://doi.org/10.1038/s41558-020-0805-1.

Tol RSJ. 2024. "A Meta-analysis of the Total Economic Impact of Climate Change." *Energy Policy* 185. https://doi.org/10.1016/j.enpol.2023.113922.

Turgul A, M McCracken, S Schmeier, ZH Rosenblum, L de Silva, and AT Wolf. 2024. "Reflections on Trans-boundary Water Conflict and Cooperation Trends." *Water International* 49 (3–4): 274–288. https://doi.org/10.1080/02508060.2024.2321727.

van Weezel S. 2015. "Economic Shocks and Civil Conflict Onset in Sub-Saharan Africa, 1981–2010." *Defense and Peace Economics* 26: 153–77. https://doi.org/10.1080/10242694.2014.887489.

Vesco P, M Kovacic, M Mistry, and M Croicu. 2021. "Climate Variability, Crop and Conflict: Exploring the Impacts of Spatial Concentration in Agricultural Production." *Journal of Peace Research* 58 (1): 98–113. https://doi.org/10.1177/0022343320971020.

von Uexkull N. 2014. "Sustained Drought, Vulnerability and Civil Conflict in Sub-Saharan Africa." Political Geography 43: 16–26. https://doi.org/10.1016/j.polgeo.2014.10.003.

von Uexkull N and H Buhaug. 2021. "Security Implications of Climate Change: A Decade of Scientific Progress." *Journal of Peace Research* 58 (1): 3–17. https://doi.org/10.1177/0022343320984210.

von Uexkull N, M Croicu, H Fjelde, and H Buhaug H. 2016. "Civil Conflict Sensitivity to Growing-Season Drought." *Proceedings of the National Academy of Sciences of the United States of America* 113 (44): 12391–12396. https://doi.org/10.1073/pnas.1607542113.

von Uexkull N, A Loy, and M d'Errico. 2023. "Climate, Flood, and Attitudes Toward Violence: Micro-level Evidence from Karamoja, Uganda." *Regional Environmental Change* 23: 57. https://doi.org/10.1007/s10113-023-02054-x.

Walch C. 2018. "Weakened by the Storm: Rebel Group Recruitment in the Wake of Natural Disasters in the Philippines." *Journal of Peace Research* 55 (3): 336–350. https://www.jstor.org/stable/48595887.

Wischnath G and H Buhaug. 2014. "On Climate Variability and Civil War in Asia." *Climatic Change* 122 (4): 709–721. https://doi.org/10.1007/s10584-013-1004-0.

Wood RM and TM Wright. 2016. "Responding to Catastrophe Repression Dynamics Following Rapid-Onset Natural Disasters." *Journal of Conflict Resolution* 60 (8): 1446–1472. https://doi.org/10.1177/0022002715596366.

Zhang DD, HF Lee, C Wang, et al. 2011. "The Causality Analysis of Climate Change and Large-Scale Human Crisis." *Proceedings of the National Academy of Sciences* 108 (42): 17296–301. https://doi.org/10.1073/pnas.1104268108.

The Harry Frank Guggenheim Foundation is a leader in creating and disseminating knowledge on the nature, consequences, and reduction of violence in its many forms, including war, crime, and human aggression.

HFG
HARRY FRANK
GUGGENHEIM
FOUNDATION

120 West 45th Street
New York, NY 10036

T 646.428.0971
www.hfg.org