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CLIMATE CHANGE AND CONFLICTS (E GILMORE, SECTION EDITOR)

Climate Change and Violence: Insights from Political Science

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Abstract
Purpose of Review The aim of this review is to understand the state of the art of research related to climate change and collectively organized violence from a broad political science perspective.
Recent Findings An increasing share of quantitative studies find a link between weather anomalies and violence for some forms of violence, but the directions are not always consistent and the mechanisms are not satisfactorily understood. Non-naturalist scholars note important reservations.
Summary Important improvements have been made during the last few years, but much remains to conclude that climate change will increase the risk of violence. An increased focus on the political consequences of adaptation and mitigation is needed.

Keywords Climate change · Civil conflict · Violence · Drought · Natural disaster · Riot

Introduction

Armed conflict is said to be development in reverse [1]. Growing awareness of negative social consequences of climate change has triggered an upsurge in studies on its implications for violence [2]. This review assesses the role climate change could play in triggering collective violence from a broad political science perspective. The form of violent conflict (hereafter referred to as conflict) studied here is collective, has two parties to it, and the aim is political rather than criminal [3, 4]. This review is based on studies published on January 1, 2014–May 31, 2017 in the 44 most prominent political science journals and cross-disciplinary journals where studies on the subject matter have clustered, aiming for complete coverage of statistical and case studies on weather or climate and studies that criticize how climate change has been linked to collective violence. Studies on wider concepts of security not focused on collective violence, of the pre-modern world, theoretical works, and reviews are excluded if not necessary for the argument [5–7]. Disciplinary journals from economics, history, and geography should be consulted for a fuller picture.

Most studies reviewed here focus on potential short-run effects of weather anomalies and disasters on violent conflict, facing several inferential challenges with regards to climate change (long-run impacts). The effect of a 1 °C temperature increase may differ from one year having 1 °C above average temperature because societies can adapt to gradual warming whereas anomalies are more unpredictable. Conversely, permanent gradual changes to climate may cause accumulated damages that are *stronger* than short-run weather anomalies. Extrapolating current patterns into the future where the change in the average climate compared to today's exceeds current anomalies can be problematic since we do not know whether adaptation or intensification effects dominate, and if future change is nonlinear or if the effects of changes to climate have a nonlinear effect on damage. There have been suggested ways of going about some of these challenges using conventional naturalist methods [8] or tools rarely applied in mainstream political science [9, 10•].

Since data availability, or frankly history, limits statistical investigations of modern societies experiencing climate

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change, with the above reservations noted, this review takes a pragmatic approach arguing that some useful information from understanding the effect of weather shocks on conflict can be gleaned to understand short- to medium-term climate change effects. This review commences with a brief outline of proposed linkages between climate anomalies and collective violence. Second, I provide a backdrop of the most central earlier debates. Thereafter, I review quantitative studies as well as case studies analyzing the suggested linkages between short-run shocks and conflict. Fourth, since the political science debate on climate change and conflict is not uniformly naturalist in its ontology, epistemology, and methodology, I discuss and review non-naturalist critiques of the dominant (naturalist) tradition. The final section discusses and concludes.

Suggested General Mechanisms

Since no overarching theoretical framework for environment-conflict linkages exist, studies frequently list several potential causal pathways. Most arguments are generic to any form of violence. Individual-level arguments on heat and aggression and in the moment direct scrambles over resources are generally eschewed in the literature on political violence [11] and therefore excluded.

The opportunity cost mechanism postulates that resource shocks causing falling incomes make individuals more attracted to selective benefits of rebel leaders compared to normal conditions. Hailing from models of crime, this argument does not differentiate between different forms of collective violence. Relative deprivation theory postulates that deprivation relative to a reference scenario creates grievances. This can spur violence in particular if groups that are easily identifiable are worse off. What kind of violence this is most likely to engender is not directly deducible, as it depends on whether an actor is perceived as culpable for the deprivation, and if so, who this is. If this is the state, protests and possibly anti-state violence can materialize. For instance, a government's inattention in the wake of natural disasters can increase the risk of anti-state protest and violence [12]. If another group is seen as the culprit, then inter-group conflict is a more likely outcome. Collective action literature argues, however, that opportunity structure as well as motivation must be in place to produce large-scale violence [12]. A mechanism which incorporates this insight holds that groups barred from meaningful political participation at the state level are less likely to redress their resource-related grievances through peaceful channels [13•]. Moreover, for a full-blown civil war to occur, it is argued that elites must be interested in challenging the government [14••]. Thus, in order for climate-related shocks to contribute to civil conflict onset, a number of contextual factors need to be in place, with some holding less organizationally demanding violence to be more directly affected by shocks [15].

Two specific mechanisms are commonly suggested. First, weather-induced crop-failure or food-price hikes can increase the risk of collective violence by affecting the mechanisms listed above [13•, 15]. Second, climate-related factors can in several ways force people to migrate [16]. This can cause conflict in at least four complementary ways: struggles between hosts and newcomers over scarce resources, when newcomers are perceived as a threat, when the demographic size of newcomers alters local power-relations, and when pre-migration tensions between the groups exist [17].

Most scholars argue that several, if not all, of the following four contextual factors are necessary for climate anomalies to have the potential to result in conflict. High levels of poverty and livelihoods with a high reliance on renewable resources are increasing the likelihood of weather shocks to produce detrimental economic conditions for large sections of the population. Institutions at multiple levels affect both the ability to address acute resource shortages and the ability of resolving these in a non-violent manner [6, 13•, 14••, 18, 19••]. Politically salient identity cleavages are argued to be facilitating factors in the face of a resource shock [6, 7, 18]. Fourth, low state capacity represents a contextual factor that increases the likelihood that resource shocks translate into violence. Moreover, state capacity can also be weakened by resource shocks. First, weak institutions may facilitate resource grabs by elites as increasing scarcity makes certain goods more valuable [6, 18]. Second, falling state revenues can reduce the rent-pie causing distributional conflicts among rent-seeking elites. Third, lower state income further reduces a state's ability to deliver public goods in periods of acute need, including maintaining law and order. Fourth, falling economic performance may lower regime legitimacy, motivating governments to stir up inter-ethnic tensions [18].

The Climate-Conflict Debate Pre-2014

An influential study by Miguel, Satyanath and Sergenti (2004) found negative rainfall growth as an instrument for economic growth to predict increases in civil conflict onset and incidence [20]. Ciccone (2011) criticizes this arguing that rainfall shocks are predominantly transitory, thus better conceptualized as deviations from a mean. When he operationalized it as deviations, he claims that conflict is unrelated to rainfall [21]. In a reply, Miguel and Satyanath (2011) disagreed [22].

Burke et al. (2009) found temperature anomalies to increase civil war incidence risk in Sub-Saharan Africa [23]. Buhaug (2010) criticizes this holding that the effect depends on three modeling choices all separately rendering the original results insignificant [24, 25]. Burke et al. (2010) concede that the relationship weakens over time, rejecting the other criticisms [26]. The debate has since resurfaced with Hsiang and Meng

(2014) holding that there was agreement on an effect of temperature [27] with Buhaug (2014) disagreeing [28]. Commentators argued that disciplinary modeling traditions could explain some differences [29].

Review studies until 2013 concluded with that there are limited links between climate anomalies and collective violence [30–34]. A meta-study and accompanying literature reviews by Hsiang, Burke and Miguel found a substantial and significant link [35–37]. This was criticized by Buhaug et al. (2014) for three main reasons: (i) data overlap in the meta-analysis; (ii) assuming causal homogeneity across different independent and dependent variables, spatial and temporal scales, time-lags, and functional forms; and (iii) excluding replication studies and oversampling of significant results. A meta-analysis adjusting for this failed to find evidence of convergence [38]. Subsequent exchanges showed few signs of agreement, with Hsiang, Burke and Miguel (2014) pointing out that most critical points were addressed in the initial study [39], and Buhaug and Nordkvelle (2014) arguing that the original modeling strategy was inappropriate [40]. Salehyan (2014) was more conciliatory arguing there was a tendency for studies to find systematic weather-conflict linkages, but that it was unclear what this meant [41], with Buhaug (2015) being skeptical towards claiming links between climate anomalies and violent conflict to be robust across studies [42]. The IPCC AR5's chapter (Adger et al. 2014) devoted to security denounced strong statements about the effects of climate change on conflict [2], though Nordås and Gleditsch (2014) note that other chapters reached different conclusions [43]. This lack of consensus represents a quite suitable point of departure for this review, as the newest studies reviewed in previous reviews were mainly published before the period under review here.

Empirical Studies 2014–2017

Table 1 provides an overview of findings from quantitative studies investigating the relationship between climate-related factors and conflict. The number of alternative specifications, control variables, probing of potential causal channels, etc., varies considerably between studies. This reflects different strategies of the individual papers and makes summarizing results a complex exercise. The use of different estimators precludes comparison of model performance statistics. Likewise, analyses often test several different independent-dependent variable constellations and test the effects on multiple sub-samples. I therefore include all independent- dependent variable constellations. If several independent variables represent different operationalizations of the same phenomenon, I report the measure the author finds most convincing or an aggregate of several results if not stated. In some instances that involved qualitative judgments of what the aggregate significance of several models was. If the author states that different dependent variables (e.g., different event databases) are different operationalizations of the same underlying phenomenon, then results are aggregated. If there are different estimation strategies—in particular IV vs. reduced form estimations, I report both unless the author states the reduced form to be biased. I also include control variables, as not doing so could exacerbate the file-drawer effect whereby results that are insignificant are toned down and relegated to "non-core" models/variables, and significant results are emphasized and therefore gain more attention. Although legitimate for the individual paper, as a research program including only the results that eventually are given most attention could bias the results in favor of significance. Conversely, the inclusion of control variables and reduced-form specifications (if not explicitly deemed biased by the author) could bias results towards insignificance. Finally, any synthesis including all studies in this field may suffer from issues of non-independence between studies' data, since several studies analyze the same or similar dependent variables with larger or smaller differences in the independent variables used and other modeling choices. Choices made during aggregation have the potential to impact findings, and can obscure important results. There are at least a dozen alternative ways of doing this, which deserve a full analysis on its own. I therefore discuss the most central patterns below. All of these choices may or may not matter for the result.

As mentioned in the mechanisms section, forms of violence that are more local and require less organizational capabilities are often seen as more likely to be affected by resource shocks than more organizationally demanding forms of violence. Each line in the table represents a different form of violence, with state-based violence at the top and more loosely organized forms of violence further down, thus crudely representing the extent of organizational resources necessary for collective action [41]. The mechanisms discussed above also demonstrate a multitude of suggested pathways that could link weather shocks with violence. Since simplification was necessary, each column represents one of four broad classes of operationalizations. I exclude analyses of food prices on conflict if they do not use weather variables to explain changes in food prices. Panel A in Table 1 might obscure the fact that several of the most general analyses may not be the most theoretically relevant. Panel B therefore excludes results from analyses at the global level and, if possible, replace them with results from developing countries/regions. If the authors test and argue for an exacerbating/conditioning effect of certain variables/contexts, then these results are reported. If there are substantial differences between panels A and B, then this could reflect that arguments should be tested in more theoretically specified settings. For reasons of symmetry between the panels, a few studies were left out. These are discussed separately in the text, and

Table 1 Weather shocks and collective violence (a) all contexts and (b) vulnerable contexts

A. Dependent variable	IV-approach							Precipitation and drought							Temperature							Disaster						
	---	--	-	ns	+	++	+++	---	--	-	ns	+	++	+++	---	--	-	ns	+	++	+++	---	--	-	ns	+	++	+++
Civil conflict onset				4							5	1						3							2	1		
Civil conflict incidence					2	1				1	4	1						2	1		1					1		
Civil conflict killed						1				1				1				1										
Battles organized actors								1			1/mx2							1/mx1		1								1
Coup/attempt				1			1				1																	
Violence against civilians								1			1/mx1		2					1		1								
Communal conflict				2							2/mx1							1										
Violent events						3	1		1	1	5/mx1	1						4		2	2				1			
Riots in general				1		1	2				2		3				1	1		2					1			1
Killed in events										1								1										1
B. Dependent variable	IV-approach							Precipitation and drought							Temperature							Disaster						
	---	--	-	ns	+	++	+++	---	--	-	ns	+	++	+++	---	--	-	ns	+	++	+++	---	--	-	ns	+	++	+++
Civil conflict onset				4							3/mx1	1						2							2	1		
Civil conflict incidence					2	1				1	1	2	2					2	1		1				1			
Civil conflict killed						1				1				1				1										
Battles organized actors											mx2	1						2		1								1
Coup/attempt				1							1																	
Violence against civilians											mx1	1	2					1		1								
Communal conflict				1							mx1	1																
Violent events						3	1		1	1	4	3						4		3	1				1			1
Riots in general					1		2				2		3				1	1		2					1			1
Killed in events										1								1										

Columns represent a broad class of operationalizations; lines represent different forms of violence; +, ++, and +++ represent marginally, conventionally, and highly significant results in line with a scarcity hypothesis, meaning that higher temperatures, less precipitation/more drought, disasters, or either of these via an indirect modeling approach (IV-approach) increase risk. Conversely, -, –, — indicate significant results contrary to a scarcity hypothesis. ns denotes insignificant results. mx plus a number denotes the number of findings that find statistically significant results that are mixed, either as a curvilinear effect or as an interaction effect which runs partially (but not fully) contrary to expectations. Some results represent averaging of several parameters. Panel A represents the most aggregate relationships. Panel B represents results from most-likely contexts (e.g., high agricultural dependence) or interactions with variables expected to amplify the effect of environmental shocks

also marked as not in the table. The signs +, ++, and +++ reflect significant support at 10, 5, and 1% levels, respectively, in accordance to a scarcity hypothesis broadly defined. That is, if less rain/more intense droughts, higher temperatures or natural disasters, or either of these indirectly via an IV-approach significantly increases conflict risk. Conversely, minus signs indicate that results are contrary to a broadly defined scarcity hypothesis, though with some qualifications for precipitation (see discussion below).

The first column "IV-approach" represents instrumental variable approaches or related indirect tests (Structural equations modeling, Boolean logit) that use weather or disaster measures to predict intermediate mechanisms that in turn are hypothesized to increase the risk of conflict. For the specific channels, both studies testing the effect of disasters on displacement find full or partial support [44, 45] as does the study on instrumenting material destruction's effect on conflict [46]. Another study on material damage and terrorism also finds an effect using an IV-strategy to address endogeneity concerns [47], not in Table 1. For food production/land productivity, one study failed to find an effect across four different measures of conflict [15]; whereas, others, often using a geographically disaggregated design, found more of an effect [48–51•]. Similarly, studies using weather to explain food prices all found an effect on less organized forms of violence [52•–54]. Whereas one study testing the effect of weather shocks on economic growth on coup risk found an effect [55], a related analysis on civil conflict onset failed to [56]. In aggregate, no results are in the opposite of the hypothesized direction, and a majority of results are marginally significant (10%) or higher. Although not implying consensus on weather shocks driving collective violence via these channels, it illustrates that contrary results are unlikely. Both panels A and B show that civil conflicts are not triggered by weather shocks even if modeled according to specific theoretical mechanisms such as food production [15], economic growth [56], disaster destruction [46], or migration [44]. For civil conflict incidence, intensity, and in particular, other more loosely organized forms of violence (excluding communal conflicts), there is some evidence of consensus.

The column labeled "Precipitation and drought" displays results for analyses testing the effect of precipitation or drought measures (these sometimes incorporate temperature). Positive signs indicate a significant relationship between less rainfall/more intense drought and conflict. Negative signs indicate that above average rainfall increases risk, which can be caused by more rains causing flood-damage, more rains causing abundant crops, or both at the same time but with locally differentiated effects. Among the studies reviewed, only two took pains to substantiate this lacunae, with both supporting the argument that above average rain reflected disaster damage [48, 57]. In aggregate, this column in both panels A and B shows quite heterogeneous results. This echoes the state of the art entering 2014 with little agreement on the effect of rainfall. Again, little suggests that civil conflicts are triggered by rainfall or drought [13•, 56, 58–61], with one study finding a conditional link in contexts expected to be less conflict-prone [60], denoted as mx in Table 1 Panel B. Regarding civil conflict incidence, one study found wetter years to run a higher risk [62], one found a quite unconditional link [63], and several others failed to find an unconditional link [13•, 58, 59, 64–66]. As reflected in panel B, four of these studies found more support in contexts deemed vulnerable [13•, 63–65] with three out of these using sub-national analyses. Regarding civil conflict dynamics, one study finds more battles between insurgent and government forces in drier and in particularly in wetter years [67]. Three geographically disaggregated studies found droughts to increase violence against civilians [68–71].

Earlier studies of communal violence in East Africa found it to be more likely during/after dry periods [72], during/after wet periods (73–74), or both [75]. This arguably has to do with peculiarities related to violent cattle raiding, which is largely unknown outside East Africa. In the period under review, two country-level studies failed to find an effect of rainfall on communal violence, but one of these found drier conditions to affect the *timing* of fighting [15, 58]. One sub-national study found drought to increase risk under certain circumstances [65] whereas another found an effect of dry and wet anomalies [76].

Several studies have analyzed collective violence more generically by including events from different forms of violence in the same study often at the sub-national scale. Panels A and B show that for precipitation and drought, findings are quite mixed with some studies detecting a relationship between above average rainfall and conflict operationalized as riots or violent events [54, 62, 77], but with approximately half of the results being insignificant or mixed [50, 53, 58, 70•, 78], and others finding support for the scarcity scenario either unconditionally or in vulnerable contexts [45, 53, 77, 79]. Some studies find heterogeneous effects for different types of violence [70•, 71]. Finally, a lone study of militarized interstate disputes (not in Table 1) find drought in both countries to decrease risk [80].

For temperature anomalies, we see that only one test detects an (marginally significant) effect in the opposite direction of expectations. Again, civil conflict onset seems unrelated to temperature shocks [58, 59, 61]; whereas, there is modest support for a relationship for its effect on incidence with some studies finding support [49, 66] and others not [62, 64]. Regarding conflict dynamics, there is modest support for a relationship [57, 62, 70•, 71]. The strongest, yet not consensual, finding is for conflict operationalized as riots or violent events with approximately a similar number of tests yielding insignificant and positive results [50, 58, 70•, 71, 77, 78, 81].

The column displaying results for the effect of natural disasters resembles the pattern for temperature, but includes

fewer tests. One out of the three studies found a direct effect on civil conflict onset [46, 82, 83], and the three studies that analyze incidence, duration, and battles also find these to be more likely in the wake of a disaster [46, 57, 84] (not in Table 1). For the remaining types of violence, there is modest support [12, 46, 83, 85–86] (86 not in Table 1). Overall, in the period under review, too few studies were conducted to draw firm conclusions, but as for temperature, results opposite of the scarcity scenario seem unlikely. Moreover, the direct effect of natural disasters on collective violence can suffer from endogeneity, but some of these studies also use an IV-approach to address this.

Not all statistical results that are relevant for this review could be fitted into the tables. Studies testing the effect of global weather phenomena such as ENSO found no effect [58, 61]. Analyses of changes in weather or climate affecting the timing of violence found heterogeneous patterns [58, 67, 87]. Two studies test the effects of gradual changes in weather over time, thus approximating long-run effect climate change. Areas in Darfur seeing above average vegetation trends since the 1980s experienced most attacks during the first years of the civil war (2003–2005) as groups in areas with worse environmental trends seized the opportunity of the civil war to capture fertile land [88•]. A study of the Niger River Basin finds little robust systematic evidence of increasing temperature and decreasing precipitation trends affecting conflict risk, but heterogeneous effects for different forms of violence under certain conditions [71].

The large-n literature can be criticized for paying insufficient attention to how institutions condition the effects of climate-related impact. Although most studies see institutions as central in preventing conflict from becoming violent [34], many studies do not follow up on this in their analyses. Two survey-based analyses from Kenya are illuminating in this regard, as they find that in areas with increasing drought over time, the presence of informal inter-community dialog [89] or the presence/increase of official or informal institutions reduces drought-induced sanctioning of violence [19••].

The literature also has a narrow focus on the conflict–absence of conflict dichotomy, neglecting how environmental change can affect cooperation and other positive forms of interaction. Understanding what facilitates cooperation under environmental stress could arguably enhance our ability to understand adaptation as cooperation can improve adaptive capacity [90]. Ironically, the conflict-cooperation perspective is much more prevalent in the literature on shared waterways, despite resource scarcity being seen as unlikely to provoke international conflicts [6]. Studies prior to the 2014-period focusing on chronic water scarcity mainly conclude that states tend to cooperate rather than fight over shared waterways, that institutional arrangements are crucial and drought has a very limited effect on disputes [33, 34, 80]. At the domestic level, one single statistical study analyzes a continuum of conflictive and cooperative events finding no effect of weather shocks [91]. A case study on the Negev desert during the most severe drought on record found grazing on crop residues (cooperative) and crop damage (conflictive) to be common forms of interaction, with very few episodes of the latter escalating. Violence occurred only when communities without prior contact met [92].

Other case studies have focused on violent conflict. A brief case study of Darfur critical to the scarcity perspective finds limited support for an indirect and time-lagged drought-conflict connection and some support for an abundance perspective. It also analyzes the role of water in the second civil war in southern Sudan as well as on interstate conflicts over the Nile and finds very little support for a scarcity scenario [93]. A study of flooding in southern Pakistan found that it opened up political space for radical groups, but agency played an important role for whether individuals were attracted by militants distributing post-disaster aid [94]. A study of the 2007–2010 drought on the Euphrates and Lower Jordan River basins sees drought-induced large-scale migration to urban areas without proper state response as contributing to conflict in Syria. Government policies exacerbated vulnerabilities to drought and explain why this particular drought led to conflict and why the more water-stressed Jordan basin averted conflict [95].

One recent study analyzes 20 cases of intergroup conflicts over scarce renewable resources in peripheral rural areas in the global South finding that no condition nor combinations thereof are sufficient or necessary for escalation. High power inequality and negative othering, recent political change, and negative resource appropriation (commercialization, privatization, or state intervention) increase the likelihood of escalation [96].

Nonnaturalist Critiques and Alternatives

Quantitative analyses of weather anomalies and conflict have, given certain assumptions being met, helped gain important insights on short-run effects of weather on conflict. This approach has been criticized by a position which to different degrees draws upon constructionism, a perspective which relies on different assumptions about how social science should be carried out. Briefly stated, a naturalist position which underpins most quantitative analyses in the field holds that there are systematic regularities in the social world, and that these can be objectively sensed, recorded, and accumulated to build knowledge using tools that allow for generalizations. A strong constructionist position holds that the social world with the patterns we perceive simply resembles subjective biases either at the personal or at a discursive level, reflecting norms and the dominant view on a topic at any time. Any patterns are therefore ephemeral and human constructs. The role of science should therefore not be cumulation, but criticizing the

dominant view as it reflects the power of scientists over the subjects whom they study. Generally speaking, the more someone favors contingent, context-dependent, and in-depth idiographic knowledge over generalizations, the closer to constructionism one is. Moreover, individual researchers might find themselves to be more or less naturalist or constructionist depending on the issue at hand. Few if any researchers within the climate-conflict field are in practice either purely naturalist or constructionist. For simplicity, I have labeled perspectives criticizing mainstream statistical work *non-naturalist*, acknowledging that this is a highly heterogeneous group of perspectives. Likewise, the position referred to as naturalist also constitutes a quite heterogeneous group.

Non-naturalist critiques have pointed out how naturalist studies can be criticized both on naturalist grounds, and from a constructionist position. The former kind of critique holds a consensus in studies on the short-run effects of weather shocks on conflict as unlikely because of what is seen as arbitrary coding of variables, untenable assumptions of climatic variations to have an immediate or near immediate causal effect, being overtly myopic in the effects that are tested, and that a multiplicity of possible mechanisms will likely cancel each other out [10•]. More purely non-naturalist critiques question the assumption in statistical investigations that the material world exerts direct effects on human behavior, despite several theoretical studies underscoring cognition and context in translating objective resources into perceptions of scarcity and subsequent framing for political mobilization [97]. Thus, operationalizations of scarcity which somehow refer to an absolute level of a resource have been criticized for not understanding that (i) scarcity should always be understood as a relational, not absolute, concept; (ii) that this "relativeness" relates to a resource's economic and political value; and (iii) that perceptions of a scarce resource as well as political, social, ideological, and economic factors structure the value of a resource [93].

Related, naturalist assumptions about uniform human behavior in response to weather shocks are also criticized, as non-naturalists stress human agency and therefore highly contingent responses to environmental shocks. Moreover, humans also turn to violence when it is a suboptimal strategy, contrary to a rationalist-naturalist model. Correlations in large-n studies could be due to tactical rather than causative effects and therefore highly context-specific [10•, 93]. This latter critique does not affect all quantitative studies, since some explicitly set out to investigate tactical considerations [50, 58, 72–75].

Non-naturalist critiques further argue that the policy environment—policy, military, and NGO actors, although less so naturalist scholarly analyses—gives a deeply problematic neo-Malthusian model prominence [93] and further reproduces stereotypes formed during the colonial era about Africa as "the dark continent," a chaotic violent place. In turn, according to some non-naturalist studies this legitimizes a continued Northern presence to civilize Africans and conserve its pristine nature [10•, 98–100]. Elites in independent African states have used this narrative to portray impending crises with themselves as a bulwark against a chaotic alternative. This helps extract "stabilizing" money from Northern sources in order to keep their regimes afloat. Four key components of this discourse are pointed out: (i) African environments are omnipotent shapers of human behavior; (ii) Africans are unable to take care of their own environment; and (iii) this results in a "Tragedy of the Commons" in turn causing anarchy. Consequently, the primacy of environmental factors in explaining violence reduces the importance of political and economic factors and agency. This then portrays poor people in LDCs as both the causes and victims of conflict [93, 98, 100]. Focusing on aggregates such as population, migration, climate, and environment, instead of issues such as clientelism, urban bias, and disincentives to invest in agriculture, allows African elites to blame failure of development on non-political sources. Moreover, it enables governments to pursue authoritarian modernization programs in the name of environmental protection, or by portraying locals as poor stewards helps justifying land grabs for commercial and conservation purposes [98, 100]. The use of "in the moment struggle"-like mechanisms in some naturalist analyses and in the portrayal of climate change's effect in the gray and popular literature, underbuilds this tendency of naturalizing violence which helps free political actors from their moral responsibility [100]. Moreover, seeing climate change as a security threat is argued to contribute to a rush for arable land to ensure food security and the creation of markets for climate change commodities (REDD+, tree planting, and biofuels). Both processes result in land buys in developing countries where rights are weak for peasants and smallholders [101]. Not all studies falling within a broad naturalist approach are blind to this; however, as some warn that mitigation and adaptation policies, if applied uncritically, might contribute to conflict [7, 78].

According to some non-naturalist analyses [98, 100], one problematic consequence of focusing on climatic factors as drivers of violence is securitization, although there is not consensus on this [102]. Briefly explained, securitization refers to a process whereby a policy field—irrespective of its objective threat to security—is lifted from the conventional political sphere and transformed into being treated as a security matter. Thus, although not necessarily vital to the survival of states from an *objective* standpoint, someone has successfully framed it as an existential threat to the extent that the audience accepts it as a security issue. A securitized field enables the use of extraordinary means and receives disproportionate attention and resources in comparison to non- or less securitized problems. Securitization can also quell debate or establish accepted facts despite shaky empirical underpinnings [102]. According to some studies holding that climate change has

been securitized, the field is dominated by a neo-Malthusian discourse of territorial security which calls for short-term military or political means to counter security threats, causing militaries to integrate potential effects of climate change on violence into their plans. Another prominent discourse that focuses on reducing vulnerability for individuals through adaptation is often used to support arguments concerning territorial securitization. Thus, civilian aid is increasingly provided by militaries, risking undermining the neutrality and independence of aid agencies [100]. While not claiming that the field has been securitized as such, another study found a broader definition of securitization to apply to the US [103]. Another analyzing newspaper articles finds territorial securitization to be dominant and on the rise in the Western press [104].

The dominance of large-n studies in investigating climate-conflict linkages has also been lamented for overshadowing idiosyncratic ways that climate change may influence violent conflict. Non-naturalist works generally call for a much stronger role for political-economic and historical analysis in the study of violent conflict in the South [10•, 98]. Insights from environmental sociology, constructivist conflict theory, and political ecology are called for [97]. Alternative models should account for the relations a resource is embedded within, and one should in particular account for how national and international processes affect local dynamics. For instance, naturalist models focusing on local variables are criticized for neglecting that state weakness is partly caused by geopolitical factors [93]. Although several non-naturalist analyses see biophysical and socioeconomic systems as important, eventually, discourses are argued to structure the perceptions of problems, identities, and how collectives act upon problems [97]. As described above, being ontologically less inclined to universal claims, non-naturalist analyses have less of a global aim than naturalists have. Thus, proposing a grand theory for cumulative knowledge in the naturalist sense is less of an ambition, although prospects for modest generalizations varies quite profoundly with some non-naturalists works arguing for modest cumulation [105] and others aiming at deconstructing what they see as a dominant neo-Malthusian narrative [100].

Discussion and Conclusion

The extent to which naturalist studies advance overtly generalist mechanisms should not be exaggerated. Despite an overarching agreement on methodology, which should lead one to expect more consensus, this tradition also harbors considerable disagreement about findings. Thus, the relationship to less generalist and constructionist positions should be seen as a continuum with naturalism and constructionism at opposite ends. Moreover, no author reviewed above argues that climate variability or change is a sufficient or necessary condition for conflict [106]. The deterministic climate-conflict model is much more present in parts of the gray and popular literature, and according to some is also taking hold in the national security community [98]. In the following, I focus on what I, based on the review above, see as four core priorities for future research.

Theory Building Through Limited Generalizations

Currently, it is not uncommon for quantitative studies to suggest several potential causes for correlations, or simply push one to the forefront without necessarily arguing for why it is more plausible than other mechanisms. Improved theorizing and subsequently more refined operationalization of both the type of conflict and the mechanism at hand are necessary. It is worthwhile to reduce the focus on universal correlations, and investigate tendencies that are contingent on contextual factors. Generally, vulnerable contexts within LDCs are where one should expect the most fertile ground for grievances related to weather shocks. For this to materialize into violent conflict, however, peaceful ways of addressing acute scarcity must be perceived as less available than contentious collective action, at least for a subsection of the population. Thus, we need to understand how people *perceive* both the resource shock, whether any actor is culpable for the situation, and what nonviolent avenues there are for addressing the problem. Survey-based studies are one promising way of addressing this [19••, 89]. Another related strategy is to limit the investigation to a setting with a dominant mode of production and test approximations of competing causal mechanisms that allow for rejecting some and keeping other hypothesized relationships [53]. These are strategies for bounded generalizations, but are beneficial for theory building as they enable us to better understand under which contexts certain mechanisms are likely to materialize.

Analyzing Medium-Run Impacts

A sole study approximating climate change by analyzing shifts in vegetation over a 20-year period finds that there was more violence in areas that have experienced a positive resource trend [88•]. In addition to representing an excellent example of mixed methods, this is a lone study which approximates changes to climate instead of weather anomalies as it compares the resource situation between two periods 20 years apart. Although this particular design risks finding spurious relationships, as the same areas experiencing positive resource trends also could share other conflict-inducing characteristics that were not controlled for. The fact that we currently have data back to the early 1960s and almost 60 years forward enables comparisons not only within a stable climatic envelope, but also to start exploring differences between time-periods that saw differences in weather averages over some time [8].

A More Conscious Use of the Dependent Variable

Table 1 shows that some operationalizations of collective violence are more affected by weather-related phenomena than others. This is particularly the case for studies that analyze events. However, exactly what an event constitutes has been neglected and needs more theoretical refinement. More attention should also be paid to potentially substantial reporting biases in some of the most frequently utilized event databases [105]. In extension, while studies of civil conflict in general have taken pains to separate the correlates of onset, duration, spread, and severity of civil conflict, no studies to date on climate-related factors and civil violence have tried to model separately what causes the outbreak, spread, severity, and duration of civil wars. At most, some studies test whether there is a difference between the onset and incidence of civil conflict, but the latter measure constitutes a hybrid of onset and duration and therefore risks watering out effects that could affect one phenomenon but not the other. While firm conclusions are premature due to the low number of studies, the fact that studies that analyze incidence rather than onset find more support, and more importantly, the few studies that analyze the dynamics of civil conflicts [58, 59, 63] find support for more narrowly defined research questions, could indicate that what determines the onset of civil conflict is less affected by weather shocks than the dynamics of ongoing conflicts. Alternatively, the lack of a correlation for the outbreak of civil conflict should lead us to search for an alternative way of detecting systematic relationships. Perhaps one should search outside the conventional statistical toolbox and apply methods that allow for equifinality such as QCA [96] or other methods that allow for complex variable configurations [51•]?

In extension, we need to broaden the scope and start investigating what absence of violent conflict means. The literature on internationally shared rivers has shown that drought can increase tensions to a certain level at which the parties decide to increase cooperation. Thus, when drought is found to increase the risk of conflict occurrence, it could reflect increased interaction, which in turn increases the likelihood of several forms of human interaction, cooperative, and conflictive alike. Although news media are less likely to report on domestic instances of cooperation, stand-offs or non-violent friction than violence, a few studies have attempted at capturing parts of the nonviolent aspects of how societies adjust to resource scarcities [73, 91, 92]. As some non-naturalist scholars argue, focusing on violence unintentionally paints a one-sided picture where human agency is quite limited. When this is then simplified in the gray and popular literature, the image that reaches the public is often quite alarmist.

Investigating Adaptation

The review above shows that empirical findings on climate and conflict are complex. Increased attention to the matter has arguably not led to effective cuts in GHG-emissions, but according to some non-naturalist works shifted the focus to where conflicts are expected to arise and justify militarized intervention in these areas. This has reduced the focus on how mitigation and adaptation policies in themselves might affect conflict. Adaptation, in itself always implying a political choice, is a marginal topic in mainstream political science literature [10•, 107•]. One lone study from the journals browsed was found [108•]. This simulated the incidence of future civil conflict using standard socioeconomic pathways built into different emissions scenarios in order to tease out which mitigation and adaptation policies would bring most and least peace. Policies of poverty alleviation and investment in human capital in poor countries by far trumps further economic growth in rich countries when it comes to decreasing the incidence of civil conflict globally. Likewise, a low-emissions pathway is equally conducive to peace as a conventional development pathway. Another study showing that political factors trump the effect of temperature anomalies in generating conflict and also warns about how insensitive adaptation policies might compromise political rights thus increasing conflict risk [78]. These studies are important as they provide information for weighing the relative risks of climate change on armed conflict. With temperatures determined to rise due to the concentration of GHG already in the atmosphere, we need a better understanding of the potentially problematic effects of mitigation and adaptation.

Compliance with Ethical Standards

Conflict of Interest The author notes no conflicts of interest.

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