



Taking Stock: the Field of Climate and Security

Joshua Busby¹

Published online: 29 September 2018
© Springer Nature Switzerland AG 2018

Abstract

Purpose of Review After nearly 15 years of study, what do we know about the relationship between climate change and security? How can scholars of climate and security inform the world of practice? These questions animate this article, with an eye towards avoiding the twin traps of policy incoherence and academic irrelevance.

Recent Findings The last 15 years of study has focused on whether climate change is directly correlated with the onset of violent internal conflict. That being inconclusive, the literature has now productively turned to studying the indirect pathways and mediating factors between climate and social conflict, including but not limited to armed violence.

Summary I focus on five different causal pathways and mediating factors that represent the frontier of research on the study of climate and conflict. These include agricultural production and food prices, economic growth, migration, disasters, and international and domestic institutions.

Keywords Climate and security · Conflict · Climate change · Environmental security

Introduction

Since the early 2000s, scholars and practitioners alike have explored the links between climate change and security. Like the earlier scholarly debate on environmental security, the academic community has largely focused narrowly on the relationship between environmental factors—in this case proxies for climate change—and armed conflict, mostly violence within countries. Practitioners, for their part, have been concerned about a wider range of phenomena, from humanitarian emergencies to migration to the impacts on military bases and missions. Where the earlier debate on environmental security consisted largely of case studies, the contemporary academic literature on climate and security has taken advantage of better datasets of environmental change and conflict to assess relationships through sophisticated quantitative methods.

This literature has produced contradictory and ambiguous findings on the direct relationship between climate factors and conflict.

Meanwhile, the policy community marched ahead and started making contingency plans about how to prepare for a variety of climate impacts on agricultural production and water and, in turn, on military operations and political stability [1–5]. Policymakers do not have the luxury of waiting for an academic consensus on the nature of the relationship between climate factors and security. However, without a strong academic foundation, the policy community runs the risk of suboptimal outcomes because policies and funding may be poorly matched to the nature of the climate-security nexus. If researchers' work is inaccessible or unaccessed by practitioners, academics might find a widening gap between their academic work and the needs of the policy community, with practitioners turning to think tanks and advocates for more useful applied work. That state of affairs would serve both communities badly, with policy potentially lacking a solid evidence base and academics marginalized to esoteric echo chambers among themselves.

After nearly 15 years of study, what do we know about the relationship between climate change and security? How can scholars of climate and security inform the world of practice? These questions animate this article, with an eye towards avoiding the twin traps of policy incoherence and academic irrelevance.

This article is part of the Topical Collection on *Climate Change and Conflicts*

✉ Joshua Busby
busbyj@austin.utexas.edu

¹ LBJ School of Public Affairs, University of Texas-Austin, Austin, TX, USA

What Do We Know?

Climate and Security

To begin to answer this question, we first have to unpack what we mean by climate and what we mean by security. While a short essay cannot do justice to these questions, it is important to raise them. Anthropogenic climate change reflects long-run changes in precipitation, temperature, and weather systems as a result of human activity, principally from the emissions of greenhouse gases. However, most of the physical effects of climate change will occur in the future, though scientists are already able to observe long-run changes in global surface temperatures. Other effects such as the incidence and severity of processes like cyclones are as yet more difficult to connect to climate change. For individual events, like a single hurricane or flood, the science of attribution, to be able to say how much more likely an event was because of climate change, is immature [6, 7]. The upshot of this observation is that it is difficult to say when precisely climate change effects should show up in the historical record.

Social scientists typically use historic events and proxies of climate-related factors to assess relationships between climate and security, such as rainfall, temperature, or extreme weather events. Those events or periods of study may reflect a time when anthropogenic climate change was not yet operative or observable or capture more short-run weather phenomena rather than longer-lived climate processes. Even if past patterns prove revealing of a particular association between climate factors and security outcomes that may not capture the effects of climate change but merely the effects of weather phenomena on security risks over a particular period. Measuring the effects of climate change might require a different set of indicators that go beyond studying historic proxies of change, such as volatility. A changing climate in the future will have different mean temperatures and precipitation patterns with a changing distribution of tail risks of extreme events. That, and a potentially changing geography of climate patterns, might yield different causal connections between climate factors and security in the future. That said, it is generally what researchers have to work with [8, 9]. What these observations mean for the discipline is unclear. Some scholars have ventured into scenario forecasting, and this holds some promise (and danger) as a theoretically informed way to assess how the future might unfold under different assumptions [10].

On the security side, the traditional study of security focuses on the nation-state and existential threats to their existence, namely armed external attacks. With inter-state war a rarer phenomenon and overtaken by internal threats, more scholars of security have gravitated to study civil wars and other kinds of internal conflict. That is no less

true in the subfield of climate and security, where many academic studies, particularly quantitative ones, have focused on climate and conflict onset links. Here, the security challenges are internal ones that threaten state integrity.

The study of climate and conflict is, of course, a narrower view on the broader field of climate and security. Like Thomas Homer-Dixon's decision in the earlier era of environment and security, most academics have gravitated to study the links between climate and conflict because conflict is tractable using conventional methods of scholarly inquiry [11]. More broad-ranging questions, such as whether climate change, will upend the international order are either more speculative or harder to scope in ways that lend themselves to normal scientific progress [12].

To be sure, there are alternative interpretations on the concept of security, which are more expansive. The concept of human security takes threats to individual human welfare as its referent rather than the state [13–16]. Studies of conflict and security in this realm, like the chapter on human security in the 2014 IPCC Fifth Assessment Report, encompass a variety of harms to human welfare from climate change, including the loss of cultural heritage, welfare losses, and armed conflict [17]. Elsewhere, I have written about how one can create a broader definition of security to encompass climate harms but avoid the risk of such conceptual stretching of security as anything bad that happens to human beings [18]. The purpose here is more of an exegesis of the field: where we are and how we got here. I focus mostly on the climate-conflict links but come back to the need for a broader perspective beyond conflict.

Much of the last 15 years of study has focused on whether climate change is directly correlated with the onset of violent internal conflict inside states, though some studies examine other indicators, such as conflict incidence. That being inconclusive, the literature has now productively turned to studying the indirect pathways and mediating factors between climate and social conflict, including but not limited to armed violence. I focus on five different causal pathways and mediating factors that represent the frontier of research on the study of climate and conflict. These include agricultural production and food prices, economic growth, migration, disasters, and international and domestic institutions [19–21].

In most of these accounts, climate hazards or variability affect the likelihood of conflict either through the effects on livelihoods, state capacity, and/or inter-group tensions. In some accounts, extreme weather or variability lowers the rewards to agriculture and/or other livelihoods and makes rebellion or violence more attractive. These same processes can also deprive states of tax revenue and undermine their capacity to suppress violence and provide public goods. They can also exacerbate tensions between groups [22].

The Association Between Climate and Conflict Is “Contested”

The IPCC Fifth Assessment report chapter on human security contained an important summary take on the relationship between climate and violence:

The evidence on the effect of climate change and variability on violence is contested. Although there is little agreement about direct causality, low per capita incomes, economic contraction, and inconsistent state institutions are associated with the incidence of violence [17].

This was a careful and nuanced statement, behind which captures several subtleties. First, when they say “violence,” they are signaling an evolution in the field, which started out largely studying the connections between climate and armed conflict, namely civil wars between states and rebel groups but has become broader to focus on communal conflict between social groups to other forms of social contestation such as strikes and riots that can escalate into violence.

Second, the IPCC conclusion that the findings “are contested” reflects some sharp methodological debates between competing camps of scholars. Early findings were inconsistent, raising questions about whether scarcity or abundance was a driver of violence. As many are aware, there was a vigorous debate between what I call the Berkeley economists and the PRIO group about the main findings in the field, which largely turned on methodological and modeling assumptions. These disagreements mostly turned on whether political and social factors ought to be included as control variables in statistical models alongside climate factors. The Berkeley economists were of the view that climate factors may affect those political and social processes so including them all in the same model would end up underestimating the role played by climate. The PRIO group worried that leaving out political and social variables biased the findings in the other direction, underweighting processes political scientists find compelling [23]. This debate was important because the Berkeley group found strong correlations between climate factors and conflict, while the PRIO group largely disputed the robustness of these findings [24–28].¹

Third, the IPCC statement also signals the recognition that it is important to study the indirect pathways between climate change and violence, such as economic contraction and the mediating role played by domestic political institutions. This

¹ The Berkeley scholars were of the view that researchers should use fixed effects models and few covariates to ensure that the effects of climate factors are not biased down by the inclusion of variables that themselves are likely affected by climate factors. The PRIO team by contrast argued for the inclusion of political and social factors as their exclusion likely biases models away from the political factors that political scientists believe are hugely important.

is the most important turn in the academic discussion because it signals a return to an interest in causal mechanisms and pathways between environmental change and security outcomes, which includes but is not limited to violence.

Causal Pathways and Mediating Factors

The study of the indirect and conditional pathways is still nascent, but here I quickly summarize some of the major pieces and findings from the literature.

Agriculture and Food Prices

Meierding several years ago urged scholars to study the indirect pathways, focusing in particular on the effects on the agricultural sector and food prices [29]. Depressed agricultural production can lower the opportunity costs of rebellion, and higher food prices might serve as a source of grievance for consumers. Work in this space includes research by Wischnath and Buhaug as well as scholarship by Smith on food price shocks, Hendrix and Brinkman on food insecurity and popular mobilization, Hendrix and Haggard on economies highly dependent on agriculture, and Von Uexkull et al.’s article on growing season rainfall shocks and political exclusion [30–34].

Economic Growth

A second related and understudied pathway is through the effects of climate on conflict through economic growth. Here, climate changes and variability would depress economic growth (perhaps through the effects on agriculture or as a result of disasters), either lowering the opportunity costs of rebellion and/or undermining state capacity to suppress violence and provide services. Early work in this space was inconclusive but was not the last word. Koubi et al.’s 2012 paper and her 2017 article are notable examples [22, 35].

There is also a vigorous empirical debate in economics on the effects of natural disasters on long-run economic growth (with work by Shabnam and Cavallo some examples) [36, 37]. That research has not been connected to the conflict piece, but if it can be established that disasters have a negative impact on economic growth, then the well-established link between economic growth and conflict would likely be operative, with disasters having an impact on conflict through economic growth [38].

Migration

A third underexplored pathway is migration. Research by Salehyan and Gleditsch suggest that refugees can bring newcomers into conflict with long-time residents over limited resources and government programs, with conflicts spilling over

to neighboring polities [39–41]. Early theorizing by Clionadh Raleigh et al. suggested climate migrants, to the extent that this is an identifiable category, might be different from refugees. They argued that many environmental migrants' movements are likely to be temporary; their departures might be seen as forced by acts of nature, making them more sympathetic to receiving locations. Moreover, environmental migrants might be so vulnerable that they are less likely to engage in violence [42]. Empirical work in this space by Koubi et al. was inconclusive [43, 44].

When we think about specific cases, migration has been identified as a driver of conflict in a number of cases including the Syrian civil war [45–47]. In that case, those connections have not been established conclusively. Several scholars have quite vigorously contested the links between drought, migration, and conflict [48–54]. While gathering evidence in a war zone impedes analysis, another challenge in establishing the connection in this case may be insufficient attention to causal mechanisms and intermediate pathways connecting climate phenomena, migration, and security outcomes. Did the migrants engage in conflict? Alternatively, did conflict start in response to scarcity pressures made worse by migrants? This is an area that is really difficult to study, but we have to be careful about *casually* connecting migration to conflict.

Disasters

A fourth channel is the effects of climate disasters on security. Disasters may lead to conflict through the effects on economic growth or potentially where failed disaster response leads to grievances by affected populations. The findings here are ambiguous, partially a function of whether we distinguish between hazards (as physical phenomena) and disasters (as social outcomes that represent failures of preparation and response). We may also have to distinguish between swift onset hazards, such as cyclones and storms from slow onset ones such as drought.

Some work suggests that disasters may precipitate peace rather than conflict, where groups rally around the common challenge of survival, where rebel movements have been too weakened by the disaster to continue the fight, or where the disaster makes a conflict ripe for resolution with targeted and well-distributed aid flows [55, 56].

Research in this space has produced conflicting findings, including papers by Slettebak, Nel and Righarts, Brancati, and Bergholt and Lujala [57–60]. There is also good related work by Quiroz Flores and Smith on disasters and leader survival, whether failed responses to disasters lead to leadership challenges in certain regimes [61, 62].

Even if we find the disaster-conflict link to be elusive, the human costs on populations and the diversion of military capacity for response together are security threats in their own right.

Institutions

A fifth area which speaks to the conditional effects of climate change is the role played by domestic and international institutions on conflict. Institutions and the supportive role played by interventions, both local and international, are key intervening factors that may diminish or exacerbate the likelihood of conflict, depending on how they are administered. Institutions affect the distribution of services, the capacity of response, and whether disputes escalate.

In terms of domestic institutions, Salehyan and Hendrix's work splits samples by regime type and/or Polity score [63]. Hendrix and Haggard do something similar with regime type in their analysis of food price spikes [32]. For their part, Von Uexkull et al. among others focus on the role played by exclusive political institutions [34]. Linke et al. draw attention to both official government and customary domestic institutions and how rules over natural resource management potentially amplify or moderate conflict [64].

In the international transboundary waters space, the role played by institutions has loomed large in work by Stefano et al. and Tir and Stinnett. Both find that river basin institutions diminish the risks of conflict by allocating water, planning for shocks, and facilitating dispute resolution [65, 66].

Nearly all of this work has been related to the connections between water and water-related extremes and conflict. Limited scholarship seeks to get at the causal mechanisms between the correlation between temperature increases and conflict. Some have posited psychological mechanisms, but we have not advanced very far on moving beyond some correlational evidence linking temperature increases to conflict [26, 67].

Moreover, most of the debate thus far has focused on conflict onset and whether climate factors make conflict more likely. Much productive work should focus on how climate affects the dynamics of conflict, moving beyond the obvious effects of recurrent seasonal changes in rainfall and temperature on fighting cycles. Here, we can start to think about whether conflicts are prolonged or shortened under certain kinds of climate change.

As methods and data get better, efforts can be more precise, to focus on changes in growing season rainfall in particular places and on particular subgroups as von Uexkull and collaborators have done in their recent work [34].

A Return to Qualitative Cases

Qualitative work in this space has not methodologically matured alongside the quantitative literature. Most of the qualitative work in this space consists of single case studies either in peer-reviewed journals but often in think tank publications that assess whether a particular conflict was made more likely by climate change, whether it be Darfur, Syria, Boko Haram in

Nigeria, or Somalia. Some more methodologically informed exceptions include works by Benjaminsen, Bretthauer, and Seter et al. [68–70]. While many of the think tank pieces are quite thoughtful, I am still reminded of Marc Levy's 1995 critique of Thomas Homer-Dixon and the first wave of research on environmental security:

The more logical research strategy under the circumstances would be to compare societies facing similar environmental problems but exhibiting different levels of violent conflict. That would permit some precision in identifying the conditions under which environmental degradation generates violent conflict and when it does not ... [71].

Since much of the quantitative literature has focused on direct correlations between climate and conflict with only flitting attempts to specify causal mechanisms, the academic community could profit from some focused comparison cases where people seek to match countries or localities on some criteria of physical exposure but different security outcomes. I say security outcomes because much more needs to be done to understand when climate factors will lead to humanitarian emergencies, whether or not they escalate to conflict. Those events often require diversion of military assets, domestic and foreign, for relief and response operations. Humanitarian emergencies are the most likely and persistent security threats practitioners have to prepare for. Preparing for those, depending on how it is done, could also make conflicts less likely in the event of exposure.

Climate and Security: Bridging the Policy-Academic Gap

Above, I argued that the connections between climate change and security are complex, contingent, and not fully understood. For policy audiences, the nuance can be frustrating. It is difficult to know what to do with such complexity, other than talk broadly of climate change as a “threat multiplier” [72, 73]. Merely saying climate forces are threat multipliers is not especially helpful, giving limited guidance about the circumstances under which climate forces are most likely to generate negative consequences.

However, the policy community has to make decisions with imperfect information. They cannot wait for academics to reach some consensus on the nature of climate-conflict links that might never materialize. What is more, policymakers have preoccupations other than conflict to worry about such as humanitarian emergencies, interstate jockeying over hydrocarbons freed up by melting Arctic ice, and people on the move for many reasons, climate among them. How can climate security academics who

aspire for policy relevance seek to orient their work without compromising academic rigor?

Lessons for Climate Security

It is very hard for social scientists to do signposting for policymakers about what sometimes ambiguous findings mean for policy, but there are some portents for how to make academic work more policy relevant. For example, Nina von Uexkull and colleagues have a piece referenced above that showed conflict risk potential was greatest in places that were highly dependent on agriculture, in areas of high political exclusion, and where growing season rainfall declined precipitously [34]. Scholars should seek to further test those findings with out of sample predictions. Provided those findings hold up, policymakers could take these insights to construct an early warning system to be incorporated in or alongside existing warning systems, such as FEWSNET, to flag those chronically vulnerable areas of high agricultural dependency and exclusion alongside those seasonal shocks in rainfall.

Let us say an early warning system for climate-related conflict existed, that would only be a beginning. Policymakers often want to know about particular places so scholars may need to make a more earnest effort to specify how their arguments travel from the general to the specific. So, in general, if social scientists can say that agricultural dependent countries with high political exclusion are vulnerable to rainy season shocks, what are the candidates that emerge from that analysis as high risk? Where are the low risk places?

Case Studies of Climate Security Vulnerability

Can scholars write narratives of political exclusion and the intersection with climate risks for particular countries? For example, take the recent Oromo people's unrest in Ethiopia that erupted in the wake of the 2015 drought. From 2016 to 2018, the Ethiopian government led by a minority Tigrayan population for 27 years experienced large protests from the Oromo people. The Oromo are a far larger ethnic group, and though junior partners in the coalition government, they had a number of grievances against the government. In February 2018, the Ethiopian prime minister, Hailemariam Desalegn, stepped down, and the ruling coalition elected Abiy Ahmed, himself of Oromo of descent, in April 2018 to succeed Desalegn.

Here is a sketch of how one might write an analytical narrative of that case that is informed by scholarship but extremely useful to policymakers.

Agricultural Dependence

Eighty percent of Ethiopians still rely on agriculture for their livelihoods; so, from a structural perspective, Ethiopia is a good candidate for potential weather-induced unrest. [74].

Political Exclusion

If one examines the latest Ethnic Power Relations score for Ethiopia through 2017, the Oromo were counted as “junior partners” in terms of political representation [75], but it is pretty clear from the recent movement that there was a feeling of political exclusion in practice. Despite accounting for 36% of the population in Ethiopia, the Oromo have felt marginalized from the seat of power, which until recently was being run largely by Tigrayans who account for 6% of the population [76].

Agricultural Season Rainfall Deviations

In 2015, the belg season rains, which normally fall between February and May, were late. The kiremt rains that normally account for about 50–80% of annual rainfall from June–September were late, volatile, and far below normal [77]. The drought was caused by an especially intense El Niño. It may be difficult to establish an anthropogenic climate change link in this particular case [78].

Needless to say, it was an especially severe and extremely rare drought, occurring “only about once every few hundred years” [78] and affected the food security of some 20 million Ethiopians, about a fifth of the population [79]. Despite the Ethiopian state’s improved ability to prevent famine compared to say the 1980s, the government still faced widespread social discontent in the wake of the drought. The drought stretched the ability of the regime to cope and perhaps diminished its capacity to prevent discontented groups from mobilizing [80].

Protests

As data from the Armed Conflict Location & Event Data project (ACLED) show, Oromo protests really took off after November 2015 [81]. A flashpoint for Oromo mobilization has been the expansion of Addis Ababa, where a 2014 master plan was set to displace more Oromo from their ancestral lands [82]. The Oromo claimed that 150,000 had already been evicted over the previous decade [83]. Oromo mobilization triggered a crackdown on the protesters and a state of emergency, with the violence claiming as many as 1200 lives. Other ethnic groups, such as the Amhara, joined the protests. With more widespread violence a possibility, the Ethiopian government shelved the Addis master plan in January 2016. However, protests continued, ultimately culminating in the resignation of the prime minister in February 2018. Tensions may be alleviated as Ethiopia installed in April 2018 a new prime minister from the Oromo people, though we will have to watch for favoritism and friction with the Tigrayans going forward [84].

An analytically informed narrative like this one about particular places could be quite useful for policy if scholars take what they know in general and try to apply it to particular

places. That said, it is vitally important to ground truth these cases with regional experts. An equally if not more plausible explanation for Oromo unrest is that the government’s planned expansion of Addis Ababa would have claimed ancestral Oromo lands and that alone triggered the protests. From this perspective, the drought had little to nothing to do with the unrest.² These explanations may be complementary rather than competing. Even if the Oromo’s grievances primarily emanated from the expansion of Addis, the timing of the unrest may have escalated in the wake of the drought when the Ethiopian central government was least capable of repressing the protests. For this case, we would still want additional detail assessing and exploring the links between the drought and the protests, but the example is suggestive of the possibilities for analytically informed, policy-relevant research.

Coming back to the Levy critique of case study work, there is still a need for paired cases. Alongside cases where climate exposure is thought to have led to negative security outcomes, cases should be matched to identify cases with similar climate exposure that did not have conflict or other security outcomes. Scholars should pair cases accordingly so that they are not constantly fixing just-so narratives around preferred explanations of conflict risk. For example, Somalia had a famine in 2011 but Ethiopia, just across the border, did not. As Carr argued, by pairing cases with different outcomes, we can isolate the conditions under which climate exposure leads to bad security outcomes in some places but not others:

Famine stops at the Somali border. I assure you this is not a political manipulation of the data – it is the data we have. Basically, the people without a functional state and collapsing markets are being hit much harder than their counterparts in Ethiopia and Kenya, even though everyone is affected by the same bad rains, and the livelihoods of those in Somalia are not all that different than those across the borders in Ethiopia and Kenya [85].

Conclusions: Beyond Early Warning

Even if scholars can construct early warning systems to identify most likely cases of climate security consequences, early warning systems do not tell policymakers much about what to do. On the disaster side of things, practitioners have an established practice for how to prevent famine including pre-positioning of aid, cash support systems, and other measures, all of which Ethiopia deployed to some success in 2015 despite the severity of the drought.

² I thank Clionadh Raleigh for this point.

However, on the conflict side, the research community needs some more empirics on what kinds of peace-building institutions, practices, and projects tend to dampen the risk of conflict. Researchers have some general findings on regime type and some more specific ideas about institutional configurations in the transboundary water space, but the academic community does not really know what institutional configurations can prevent conflict, particularly resource or climate-related conflicts. Social scientists have to do more than say development is the best tonic for conflict, as we have 70 years of development practice, with a foreign aid industry that continues to struggle to identify what kinds of approaches are most successful.

There are some tantalizing portents from randomized control trials (RCTs) that have become quite common in development, though I am suspicious of project level interventions in the absence of national government institutional change, or the utility of RCTs for transboundary resource issues or regional resource management institutions.

That said, scholars have to try to develop some more standard rules of thumb for what interventions dampen the risk of conflict like those we have for transboundary water management: institutions that do dispute resolution, that allocate flows, that have plans in place for shocks, etc. What kinds of investments work best? Is there a proper sequencing?

This may be a bit of a stretch for academics, but where researchers have some confidence in the clarity of their findings, they can and should draw important lessons for policy. That said, social scientists need to do a better job translating research in ways that are useful for decision-makers.

References

- National Intelligence Council. Global water security [Internet]. 2012 Mar. Available from: http://www.dni.gov/files/documents/Special%20Report_ICA%20Global%20Water%20Security.pdf.
- Office of the Director of National Intelligence. Global food security intelligence community assessment [Internet]. ODNI. 2015 [cited 2016 Oct 12]. Available from: <https://www.dni.gov/index.php/newsroom/reports-and-publications/207-reports-publications-2015/1265-global-food-security-intelligence-community-assessment>.
- Department of Homeland Security. Department of Homeland Security climate change adaptation roadmap [Internet]. 2012 Jun. Available from: https://www.dhs.gov/sites/default/files/publications/Appendix%20A%20DHS%20FY2012%20Climate%20Change%20Adaptation%20Plan_0.pdf.
- Fingar T. National intelligence assessment on the national security implications of global climate change to 2030 [internet]. 2008. Available from: http://www.dni.gov/testimonies/20080625_testimony.pdf.
- Office of the Director of National Intelligence. Implications for US national security of anticipated climate change [Internet]. ODNI. 2016 [cited 2018 Jun 18]. Available from: <https://www.dni.gov/index.php/newsroom/reports-publications/reports-publications-2016/item/1629-implications-for-us-national-security-of-anticipated-climate-change>.
- Tebaldi C. Pushing the envelope of climate science ‘attribution studies’ [Internet]. 2010. Available from: <http://www.climatecentral.org/blog/pushing-the-envelope-of-climate-science-attribution-studies/>.
- Mooney C. Katrina, Sandy, Harvey. The debate over climate and hurricanes is getting louder and louder. Washington Post [Internet]. 2017 Aug 30 [cited 2018 Jun 18]; Available from: <https://www.washingtonpost.com/news/energy-environment/wp/2017/08/30/katrina-sandy-harvey-the-debate-over-climate-and-hurricanes-is-getting-louder-and-louder/>.
- Wagner G, Weitzman ML. Climate Shock: The economic consequences of a hotter planet. Princeton: Princeton University Press; 2015. p. 264.
- Busby JW, Gullede J, Smith TG, White K. Of climate change and crystal balls: the future consequences of climate change in Africa. Air Space Power J Afr Francoph. 2012;(3):4–44. Available from: http://www.airpower.au.af.mil/apjinternational/apj-af/2012/2012-3/eng/2012_3_05_Busby.pdf.
- Hegre H, Buhaug H, Calvin KV, Nordkvelle J, Waldhoff ST, Gilmore E. Forecasting civil conflict along the shared socioeconomic pathways. Environ Res Lett. 2016 [cited 2016 Aug 30];11(5):054002. Available from: <http://stacks.iop.org/1748-9326/11/i=5/a=054002>.
- Homer-Dixon TF. On the threshold: environmental changes as causes of acute conflict. Int Secur. 1991;16(2):76–116.
- Busby J. Warming world. Foreign Affairs. 2018 Jun 14 [cited 2018 Jun 18];(July/August 2018). Available from: <https://www.foreignaffairs.com/articles/2018-06-14/warming-world>.
- Paris R. Human security: paradigm shift or hot air? Int Secur. 2001;26(2):87–102.
- Paris R. Still an inscrutable concept. Secur Dialogue. 2004;35(3):370–2.
- Barnett J, Matthew RA, O’Brien KL. Global environmental change and human security: an introduction. In: Matthew RA, Barnett J, McDonald B, O’Brien KL, editors. Global environmental change and human security. Cambridge: MIT Press; 2010. p. 3–32.
- Najam A, editor. Environment, development and human security: perspectives from South Asia. Lanham: UPA; 2003. 294 p
- Adger WN, Pulhin JM, Barnett J, Dabelko GD, Oswald Spring U, Vogel CH. 2014: Human security. In: Field CB, Barros VR, Dokken DJ, Mach KJ, Mastrandrea MD, Bilir TE, et al.. Climate change 2014: impacts, adaptation, and vulnerability. Part A: global and sectoral aspects contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge and New York; 2014. p. 755–91.
- Busby JW. Who cares about the weather? Climate change and U.S. national security. Secur Stud. 2008;17(3):468–504.
- Busby J. Environmental security. In: Wohlforth WC, Gheciu A, editors. Handbook of international security. Oxford: Oxford University Press; 2017. p. 471–86.
- Hendrix C, Gates S, Buhaug H. Environment and conflict. In: Mason TD, Mitchell SM, editors. What do we know about civil wars? Reprint ed. Lanham, Maryland: Rowman & Littlefield Publishers; 2016. p. 231–46.
- Theisen OM. Climate change and violence: insights from political science. Curr Clim Change Rep. 2017 Dec 1 [cited 2018 Jun 18];3(4):210–21. Available from: <https://link.springer.com/article/10.1007/s40641-017-0079-5>.
- Koubi V, Bernauer T, Kalbhenn A, Spilker G. Climate variability, economic growth, and civil conflict. J Peace Res. 2012 [cited 2013 Apr 2];49(1):113–27. Available from: <http://jpr.sagepub.com/content/49/1/113>.
- O’Loughlin J, Linke AM, Witmer FDW. Modeling and data choices sway conclusions about climate-conflict links. Proc Natl Acad Sci.

- 2014 [cited 2016 Nov 29];111(6):2054–5. Available from: <http://www.pnas.org/content/111/6/2054>.
24. Hsiang SM, Meng KC, Cane MA. Civil conflicts are associated with the global climate. *Nature*. 2011;476(7361):438–41. <https://doi.org/10.1038/nature10311>.
 25. Buhaug H. Climate not to blame for Africa's civil wars. *Proc Natl Acad Sci*. 2010;107(38):16477–82.
 26. Hsiang S, Burke M, Miguel E. Quantifying the influence of climate on human conflict. *Science*. 2013;341:1235367.
 27. Buhaug H, Nordkvelle J, Bernauer T, Böhmelt T, Brzoska M, Busby JW, et al. One effect to rule them all? A comment on climate and conflict. *Clim Change*. 2014 [cited 2015 Jun 12];127(3–4):391–7. Available from: <http://link.springer.com/article/10.1007/s10584-014-1266-1>.
 28. Buhaug H. Concealing agreements over climate–conflict results. *Proc Natl Acad Sci*. 2014 [cited 2014 Apr 5];111(6):E636–E636. Available from: <http://www.pnas.org/content/111/6/E636>.
 29. Meierding E. Climate change and conflict: avoiding small talk about the weather. *Int Stud Rev*. 2013;15(2):185–203 Available from: <http://onlinelibrary.wiley.com/doi/10.1111/misr.12030/abstract>.
 30. Wischnath G, Buhaug H. Rice or riots: on food production and conflict severity across India. *Polit Geogr*. 2014 [cited 2016 Dec 1];43:6–15. Available from: <http://www.sciencedirect.com/science/article/pii/S0962629814000602>.
 31. Hendrix C, Brinkman H-J. Food insecurity and conflict dynamics: causal linkages and complex feedbacks. *Stab Int J Secur Dev*. 2013 [cited 2013 Oct 1];2(2). Available from: <http://www.stabilityjournal.org/article/view/sta.bm>.
 32. Hendrix CS, Haggard S. Global food prices, regime type, and urban unrest in the developing world. *J Peace Res*. 2015 [cited 2018 Jun 18];52(2):143–57. <https://doi.org/10.1177/0022343314561599>.
 33. Smith TG. Feeding unrest Disentangling the causal relationship between food price shocks and sociopolitical conflict in urban Africa. *J Peace Res*. 2014 [cited 2015 Jun 12];51(6):679–95. Available from: <http://jpr.sagepub.com/content/51/6/679>.
 34. von Uexkull N, Croicu M, Fjelde H, Buhaug H. Civil conflict sensitivity to growing-season drought. *Proc Natl Acad Sci*. 2016 [cited 2016 Oct 19];201607542. Available from: <http://www.pnas.org/content/early/2016/10/12/1607542113>.
 35. Koubi V. Climate change, the economy, and conflict. *Curr Clim Change Rep*. 2017;3(4):2000–9.
 36. Shabnam N. Natural disasters and economic growth: a review. *Int J Disaster Risk Sci*. 2014 [cited 2017 Mar 10];5(2):157–63. Available from: <https://link.springer.com/article/10.1007/s13753-014-0022-5>.
 37. Cavallo E, Galiani S, Noy I, Pantano J. Catastrophic natural disasters and economic growth. *Rev Econ Stat*. 2013 [cited 2017 Mar 10];95(5):1549–61. https://doi.org/10.1162/REST_a_00413.
 38. Collier P. The bottom billion: why the poorest countries are failing and what can be done about it. Oxford, New York: Oxford University Press; 2007. xiii, 205 p. Available from: <http://www.loc.gov/catdir/toc/ecip074/2006036630.html>.
 39. Salehyan I, Gleditsch KS. Refugees and the spread of civil war. *Int Organ*. 2006;60(2):335–66.
 40. Reuveny R. Climate change-induced migration and violent conflict. *Polit Geogr*. 2007;26(6):656–73.
 41. Reuveny R, Moore WH. Does environmental degradation influence migration? Emigration to developed countries in the late 1980s and 1990s. *Soc Sci Q*. 2009;90(3):461–79.
 42. Raleigh C, Jordan L, Salehyan I. Assessing the impact of climate change on migration and conflict. *The Social Dimensions of Climate Change 2008*. Available from: http://siteresources.worldbank.org/EXTSOCIALDEVELOPMENT/Resources/SDCCWorkingPaper_MigrationandConflict.pdf.
 43. Koubi V, Spilker G, Schaffer L, Bernauer T. Environmental stressors and migration: evidence from Vietnam. *World Dev*. 2016 [cited 2016 Dec 1];79:197–210. Available from: <http://www.sciencedirect.com/science/article/pii/S0305750X1500296X>.
 44. Freeman L. Environmental change, migration, and conflict in Africa: a critical examination of the interconnections. *J Environ Dev*. 2017 [cited 2018 Jun 18];26(4):351–74. <https://doi.org/10.1177/1070496517727325>.
 45. Gleick PH. Water, drought, climate change, and conflict in Syria. *Weather Clim Soc*. 2014 [cited 2016 Jun 14];6(3):331–40. Available from: <http://journals.ametsoc.org/doi/abs/10.1175/WCAS-D-13-00059.1>.
 46. Werrell CE, Femia F, editors. *The Arab Spring and climate change*. Washington, D.C.: Center for American Progress, Stimson Center, and the Center for Climate and Security; 2013 [cited 2013 Sep 26]. Available from: <http://www.americanprogress.org/issues/security/report/2013/02/28/54579/the-arab-spring-and-climate-change/>.
 47. Kelley CP, Mohtadi S, Cane MA, Seager R, Kushnir Y. Climate change in the Fertile Crescent and implications of the recent Syrian drought. *Proc Natl Acad Sci*. 2015 [cited 2016 May 24];112(11):3241–6. Available from: <http://www.pnas.org/content/112/11/3241>.
 48. Fröhlich CJ. Climate migrants as protestors? Dispelling misconceptions about global environmental change in pre-revolutionary Syria. *Contemp Levant*. 2016;1(1):38–50. <https://doi.org/10.1080/20581831.2016.1149355>.
 49. Châtel FD. The role of drought and climate change in the Syrian uprising: untangling the triggers of the revolution. *Middle East Stud*. 2014;50(4):521–35. <https://doi.org/10.1080/00263206.2013.850076>.
 50. Selby J, Dahi OS, Fröhlich CJ, Hulme M. Climate change and the Syrian civil war revisited. *Polit Geogr*. 2017;60:232–44.
 51. Hendrix CS. A comment on “climate change and the Syrian civil war revisited”. *Polit Geogr*. 2017;60:251–2.
 52. Gleick PH. Climate, water, and conflict: commentary on Selby et al. 2017. *Polit Geogr*. 2017;60:248–50.
 53. Kelley CP, Mohtadi S, Cane M, Seager R, Kushnir Y. Commentary on the Syria case: climate as a contributing factor. *Polit Geogr*. 2017;60:245–7.
 54. Selby J, Dahi OS, Fröhlich CJ, Hulme M. Climate change and the Syrian civil war revisited: a rejoinder. 2017;60:253–5.
 55. Kelman I. Island security and disaster diplomacy in the context of climate change. *Cah Sécurité*. 2006;63:61–94 Available from: <http://www.disasterdiplomacy.org/kelman2006cce.pdf>.
 56. Egorova A, Hendrix C. Can natural disasters precipitate peace? Research brief—August 2014. Strauss Center for International Security and Law; 2014 Aug [cited 2018 Jun 18]. Available from: <https://www.strausscenter.org/ccaps/publications/research-briefs.html?download=261>.
 57. Slettebak RT. Don't blame the weather! climate-related natural disasters and civil conflict. *J Peace Res*. 2012 [cited 2012 May 21];49(1):163–76. Available from: <http://jpr.sagepub.com/content/49/1/163>.
 58. Nel P, Righarts M. Natural disasters and the risk of violent civil conflict. *Int Stud Q*. 2008;52(1):159–85.
 59. Brancati D. Political aftershocks: the impact of earthquakes on intrastate conflict. *J Confl Resolut*. 2007;51(5):715–43.
 60. Bergholt D, Lujala P. Climate-related natural disasters, economic growth, and armed civil conflict. *J Peace Res*. 2012 [cited 2012 May 21];49(1):147–62. Available from: <http://jpr.sagepub.com/content/49/1/147>.
 61. Quiroz Flores A. Protecting people from natural disasters: political institutions and ocean-originated hazards. *Polit Sci Res Methods*. 2015 [cited 2016 Apr 7];FirstView:1–24. Available from: http://journals.cambridge.org/article_S2049847015000722.
 62. Flores AQ, Smith A. Surviving disasters. 2010. Available from: http://politics.as.nyu.edu/docs/IO/14714/Surviving_Disasters.pdf.

63. Salehyan I, Hendrix CS. Climate shocks and political violence. *Glob Environ Change*. 2014 [cited 2016 Dec 1];28:239–50. Available from: <http://www.sciencedirect.com/science/article/pii/S0959378014001344>.
64. Linke AM, Witmer FDW, O’Loughlin J, McCabe JT, Tir J. Drought, local institutional contexts, and support for violence in Kenya. *J Confl Resolut*. 2018 [cited 2018 Sep 5];62(7):1544–78. <https://doi.org/10.1177/0022002717698018>.
65. Stefano LD, Duncan J, Dinar S, Stahl K, Strzepek KM, Wolf AT. Climate change and the institutional resilience of international river basins. *J Peace Res*. 2012 [cited 2015 Jun 12];49(1):193–209. Available from: <http://jpr.sagepub.com/content/49/1/193>.
66. Tir J, Stinnett DM. Weathering climate change: Can institutions mitigate international water conflict? *J Peace Res*. 2012 [cited 2015 Jun 12];49(1):211–25. Available from: <http://jpr.sagepub.com/content/49/1/211>.
67. Bollfrass A, Shaver A. The effects of temperature on political violence: global evidence at the subnational level. *PLoS One*. 2015 [cited 2018 Jun 18];10(5):e0123505. Available from: <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0123505>.
68. Benjaminsen TA, Alinon K, Buhaug H, Buseth JT. Does climate change drive land-use conflicts in the Sahel? *J Peace Res*. 2012 [cited 2016 Aug 11];49(1):97–111. Available from: <http://jpr.sagepub.com/content/49/1/97>.
69. Brethauer JM. Conditions for peace and conflict: applying a fuzzy-set qualitative comparative analysis to cases of resource scarcity. *J Confl Resolut*. 2015 [cited 2018 Sep 5];59(4):593–616. Available from: <http://journals.sagepub.com/doi/10.1177/0022002713516841>.
70. Seter H, Theisen OM, Schilling J. All about water and land? Resource-related conflicts in East and West Africa revisited. *GeoJournal*. 2018 [cited 2018 Sep 5];83(1):169–87. <https://doi.org/10.1007/s10708-016-9762-7>
71. Levy MA. Is the environment a national security issue? *Int Secur*. 1995;20(2):35–62.
72. CNA Corporation. National security and the threat of climate change. 2007. Available from: <http://securityandclimate.cna.org/report/>.
73. Campbell KM, Gullede J, McNeill JR, Podesta J, Ogden P, Fuerth L, et al. The age of consequences. 2007. Available from: http://www.csis.org/media/csis/pubs/071105_ageofconsequences.pdf.
74. UNDP. About Ethiopia [Internet]. UNDP in Ethiopia. [cited 2018 Jun 18]. Available from: <http://www.et.undp.org/content/ethiopia/en/home/countryinfo.html>.
75. Vogt M, Bormann N-C, Rüeegger S, Cederman L-E, Hunziker P, Girardin L. Integrating data on ethnicity, geography, and conflict: the ethnic power relations data set family. *J Confl Resolut*. 2015 [cited 2018 Jun 18];59(7):1327–42. <https://doi.org/10.1177/0022002715591215>
76. Economist. A charismatic young leader tries to calm ethnic tension in Ethiopia. *Economist*. 2018 [cited 2018 Jun 18]. Available from: <http://media.economist.com/news/middle-east-and-africa/21740040-abiy-ahmed-first-leader-modern-ethiopian-history-identify-oromo>.
77. ReliefWeb. Ethiopia: drought—2015–2018. ReliefWeb. 2018 [cited 2018 Jun 18]. Available from: <https://reliefweb.int/disaster/dr-2015-000109-eth>.
78. Climate and Development Knowledge Network. Science summary: the drought in Ethiopia, 2015. ReliefWeb. 2017 [cited 2018 Jun 18]. Available from: <https://reliefweb.int/report/ethiopia/science-summary-drought-ethiopia-2015>.
79. Waal AD. Is the era of great famines over? *The New York Times*. 2016 May 8 [cited 2016 Jun 14]; Available from: <http://www.nytimes.com/2016/05/09/opinion/is-the-era-of-great-famines-over.html>.
80. Fortin J. Ethiopia, a nation of farmers, strains under severe drought. *The New York Times*. 2015 [cited 2018 Jun 18]; Available from: <https://www.nytimes.com/2015/10/19/world/africa/ethiopia-a-nation-of-farmers-strains-under-severe-drought.html>.
81. Pinaud M, Raleigh C. Data analysis: the roots of popular mobilization in Ethiopia. IPI Global Observatory. 2017 [cited 2018 Jun 18]. Available from: <https://theglobalobservatory.org/2017/06/ethiopia-protests-oromo-addis-ababa-master-plan/>.
82. UNPO. UNPO: Oromo: worst drought in over a decade hits Ethiopia. 2015 [cited 2018 Jun 18]. Available from: <http://unpo.org/article/18653>.
83. Solomon S. Ethiopia boundary dispute puts human rights violations in spotlight. *VOA*. 2016 [cited 2018 Jun 18]. Available from: <https://www.voanews.com/a/human-rights-violations-in-the-spotlight-in-ethiopia-boudnary-dispute/3161226.html>.
84. Mariam A. With new prime minister, Ethiopia takes a step back from the precipice. *The Hill*. 2018 [cited 2018 Jun 18]. Available from: <http://thehill.com/opinion/international/382024-with-new-prime-minister-ethiopia-takes-a-baby-step-back-from-the>.
85. Carr ER. Drought does not equal famine. *Open the Echo Chamber*. 2011. Available from: <http://www.edwardrcarr.com/opentheechochamber/2011/07/21/drought-does-not-equal-famine/>.