What have we learned about climate change and interstate conflict in the last decade?

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Abstract

A review of the extant literature reveals little consensus on the relationship between climate change and global conflict. A general model of the relationship between climate and conflict is discussed. It is argued that pathways from climate change to interstate conflict are difficult to identify due to multiple stressors resulting from climate change occurring simultaneously, with an array of possible interactions that are relevant in specific contexts. In particular, the literature on trans-state water scarcity and variability demonstrates tendencies towards both conflict and cooperation. Directions for future research are proposed to assist policymakers to anticipate international tensions caused by climate change and design targeted interventions to address the risks.

Introduction

Identifying the pathways from climate change to interstate conflict is inherently difficult. There are multiple stressors resulting from climate change, occurring simultaneously, that pose a unique risk to interstate conflict. Furthermore, while much useful research has been done, its focus has been too narrow and insufficiently focused on possible interactions between simultaneous climate change phenomena and interstate conflict. This paper argues that the combination of multiple stressors occurring together, and the narrow and partial focus of the literature up until now, has limited the understanding of the nexus between climate change and interstate conflict. It also offers limited direction to security policymakers concerned about the implications of climate change effects and interstate conflict risk. The first section of the paper provides the theoretical and empirical background, and the rationale for increased attention to the climate change–interstate conflict relationship. This is followed by a snapshot of the literature on climate change and interstate conflict that contributes to our current, but limited, understanding of the relationship. Here it will be shown that the literature reveals a lack of focus on the interaction between multiple climate change factors and how such interactions impact on global security. The final section draws on the literature review to propose directions for future research that may assist policymakers to anticipate international tensions caused by climate change and design targeted interventions to address the risks.

Background and rationale

Expert opinion suggests that conflict risk from climate change will increase from 5 per cent at present, to up to 13 per cent, given a rise in global mean temperature of 2ºC above pre-industrial levels, and up to 26 per cent given a rise of 4ºC.[1] A review of the current literature reveals neither consensus on the relationship between climate change and conflict nor unequivocal empirical evidence to support any specific claims about their relationship. Indeed, Scartozzi has recently concluded that '(d)espite hundreds of published studies, there is still low confidence in the validity of the findings due to lack of consistency of evidence and low degree of agreement'.[2] The contingent nature of the relationship

[1] Katharine Mach et al., 'Climate as a Risk Factor for Armed Conflict', *Nature* 571, no. 7764 (2019): 193–97.

[2] Cesare Scartozzi, 'Reframing Climate-Induced Socio-Environmental Conflicts: A Systematic Review', *International Studies Review* 23, no. 3 (2020): 696–725.

between climate change and conflict, and the relative strength of climate change as a driver of conflict[3] suggest more focused study of the climate–conflict nexus is needed. Szayna et al. note, 'the most dire climate-change scenarios might … fundamentally change the extent of violent conflict'.[4] Given the potential security threats arising from climate change,[5] it is puzzling that so little research is being conducted in this area. Assuming that the framing of climate change as a security issue is not a self-fulfilling prophecy,[6] policymakers need to be better informed to anticipate international tensions caused by climate change and design targeted interventions to address the risks.

Focused study of the nexus between climate change and interstate conflict is warranted in order to develop a better understanding of what contributes to peace as well as conflict. While the frequency of interstate conflict has declined significantly in recent times,[7] the impact of climate change is increasing. However, there is likely to be a spurious negative association between the two.[8] Whether climate change is contributing to global peace cannot be assumed from the available evidence; rather, it requires a close examination of both multiple stressors occurring together and interactions between simultaneous climate change phenomena. For example, climate-related agriculture shocks that cause human migration can jointly reduce potential conflict risk in the absence of inter-group inequalities between identity groups at the destination. Furthermore, any tendency towards peace increases the importance of studying the relationship between states that experience climate-induced stressors and avoid conflict, to better assess contextual factors that contribute to peaceful environments.[9]

Greater emphasis on the study of the climate change–interstate conflict nexus is also necessary to develop a better understanding of climate change as a threat multiplier in an international context of great power competition. To the extent that climate change amplifies existing socio-economic, political, and/or institutional risks, it may expose security vulnerabilities that could lead to a change in the balance of power, with consequences for global conflict. For example, the transition to low carbon emissions renewable energy resources has obvious implications for fossil fuel–dependent states. Rising sea levels potentially compromise US naval assets in the Pacific and affect power relations in the Indo-Pacific region.[10] Similar risks are faced by alliances such as the North Atlantic Treaty Organization (NATO) in the Atlantic.[11] Moreover, climate change has the potential to elicit new motivations for interstate conflict. The melting of Arctic ice, for example, which reduces the costs of accessing oil and mineral deposits and increases shipping lanes, may contribute to future great power rivalries and interstate conflict.[12] These high-cost risks from multiple stressors occurring together cannot be underestimated.

Finally, it is reasonable to conjecture that an understanding of the ways in which climate change and global conflict interact will shed light on new arenas for interstate competition. Soft power potentially attaches to leadership on climate change with implications for the conflict–peace spectrum.[13] At a critical time in the global response to climate change, domestic climate policy can demonstrate a state's credentials as climate advocate, which can then be used to leverage its influence and networks towards achieving cooperation on global climate action. Whether soft or hard power, increased attention to the relationship between climate change and interstate conflict (or peace) is timely. The next section

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[3] Idean Salehyan, 'From Climate Change to Conflict? No Consensus Yet', *Journal of Peace Research* 45, no. 3 (2008): 315–26.

[4] Thomas Szayna et al., *Conflict Trends and Conflict Drivers: An Empirical Assessment of Historical Conflict Patterns and Future Conflict Projections* (Santa Monica, CA: RAND Corporation, 2017), www.rand.org/pubs/research_reports/RR1063.html.

[5] Nina Von Uexkull, and Halvard Buhaug, 'Security Implications of Climate Change: A Decade of Scientific Progress', *Journal of Peace Research* 58, no. 1 (2021): 3–17.

[6] Nils Petter Gleditsch, 'Whither the Weather? Climate Change and Conflict', *Journal of Peace Research* 49, no. 1 (2012): 3–9.

[7] Szayna et al., *Conflict Trends and Conflict Drivers*.

[8] Erik Gartzke, 'Could Climate Change Precipitate Peace?', *Journal of Peace Research* 49, no. 1 (2012): 177–92.

[9] Ayyoob Sharifi et al., 'Climate-Induced Stressors to Peace: A Review of Recent Literature', *Environmental Research Letters* 16, no. 7 (2021): article 073006.

[10] John Allen and Bruce Jones, 'What Climate Change Will Mean for U.S. Security and Geopolitics', *Order From Chaos* (blog), *Brookings*, 4 February 2021.

[11] Amar Causevic, 'Facing an Unpredictable Threat: Is NATO Ideally Placed to Manage Climate Change as a Non-Traditional Threat Multiplier?', *Connections: The Quarterly Journal* 16, no. 2 (2017): 59–80.

[12] Vally Koubi, 'Climate Change and Conflict', *Annual Review of Political Science* 22, no. 1 (2019): 343–60; Brian La Shier and James Stanish, 'The National Security Impacts of Climate Change', *Journal of National Security Law and Policy*, no. 10 (2019): 27–43.

[13] Marie Dejonghe, 'Will Only a Green Power Remain Great Power?' (Security Policy Brief no. 144, 2021), 144.

discusses the literature on climate change and interstate conflict that contribute to our current, but limited, understanding of their complex relationship.

Relationship between climate change and interstate conflict

It is inherently difficult to identify the pathways between climate change and interstate conflict. The relationships are indirect, with climate change a threat multiplier that requires consideration of multiple mechanisms, stressors, and interactions that are relevant in specific contexts.[14] Mis-specification or omission of the variables, their interactions, control variables, or the form of the relationship can all militate against finding a significant statistical result in empirical studies. Case studies have contributed to greater understanding of the contingent nature of the climate change–interstate conflict relationship but highlight a basic tension between generalisability and context specificity. One major achievement of recent research is to identify and link specific potential conflict hotspots to conflict minimisation mechanisms.

A general model of the relationship between climate and conflict is shown in Table 1. With three motivations for conflict (greed, grievances, and opportunism), climate is typically measured in its variability (temperature or rainfall) or by shocks (natural disasters), leading to changes in access to resources (scarcity and abundance), agricultural productive yields (food security), market forces (economic shocks), migration (displacement and population pressures) and state capacity (financial resources and administrative capability). Contextual variables identify the scope conditions under which climatic changes or events alter the likelihood of conflict (e.g. socio-economic development, history of conflict, and political stability). The interactions between drivers, shocks, and contextual variables increase the uncertainties surrounding the specification of the model[15] with the possibility of a feedback loop where a factor becomes both a cause and consequence of climate change.[16] According to expert analysis,[17] economic shocks are considered the most robust pathway from climate to armed conflict, followed by natural resource dependency, although their influence on conflict risk is judged to be relatively low.

Climate change →	Interacting with →	Mediated by →	Leads to conflict because of
Geophysical processes; Climate impacts	Resource base; Economy/trade/ markets; Human displacement; State capac- ity/governance	Socioeconomic factors; Environmental/ geographic factors; Institutional/political factors; Exposure/vulnerability; Culture/ethnicity; etc.	Greed; Grievances; Tactical opportunities

Table 1: Indirect causal pathways from climate change to conflict.

Source: Reproduced from Cesare Scartozzi, 'Reframing climate-induced socio-environmental conflicts', Table 2.

[14] Koubi, 'Climate Change and Conflict'.

[15] Katharine Mach and Caroline Kraan, 'Science–Policy Dimensions of Research on Climate Change and Conflict', *Journal of Peace Research* 58, no. 1 (2021): 168–76.

[16] Christopher Carleton, Mark Collard, Mathew Stewart, and Huw Groucutt, 'A Song of Neither Ice nor Fire: Temperature Extremes Had No Impact on Violent Conflict among European Societies During the 2nd Millennium CE', *Frontiers in Earth Science* 9 (2021): article 769107.

[17] Mach et al., 'Climate as a Risk Factor for Armed Conflict'.

Following the early work of Homer-Dixon,[18] in the last decade the literature has paid most attention to conflict arising from grievances over transboundary water shortages, with a distinct strand linking grievances to opportunities for cooperation and conflict resolution. The emphasis has been predominantly on *resource scarcity* involving shared water resources.[19] The contingent nature of the nexus is demonstrated by Schmidt, Lee and McLaughlin Mitchell,[20] who argue that changes in resource scarcity and environmental uncertainty increase the likelihood of both diplomatic and military force for states without sovereignty over disputed resources. On the other hand, Devlin and Hendrix[21] show that while scarcity arising from lower mean levels of rainfall and higher variability increase the likelihood of interstate conflict, shared scarcity reduces the short-term risk. Thus, renewable resource scarcity is not necessarily a zero-sum equation.

More generally, Bernauer and Böhmelt[22] identify 12 determinants of interstate water cooperation and conflict, which is indicative of the complexity of the potential causal pathways. The determinants include natural resource dependency, precipitation change variability, socio-economic development and food security, geographical characteristics, form of government and legal system, and various alliances and cooperative arrangements between states. The main area of debate concerns the extent to which market forces and social and technological innovations can ameliorate tendencies to conflict.[23] The neo-Malthusian argument that a more variable or scarcer water supply, together with greater consumption from economic development and population growth, is a catalyst for increasing international conflict has produced equivocal empirical findings of heightened security risks. Gartzke[24] argues that there is a reduced risk of interstate conflict as developed states face a declining utility from territorial conquest—the interdependence from trade cancels out the incentives for violent conflict. Risks can also be lowered by technological innovations and socio-political interventions. Tir and Stinnett[25] find the risk of escalation of interstate conflict from water scarcity can be lowered with tailored agreement and institutional arrangements that monitor behaviour, have conflict resolution and enforcement mechanisms, and delegate authority to third parties. Given this tendency towards cooperation, Koubi et al.[26] conclude that resource scarcity is less important than economic and political factors. While I accept that economic factors are likely to be a primary determinant of conflict and cooperation, our current state of knowledge concerning the effect of multiple stressors occurring concurrently, as well as their interactions, suggests caution in ranking and discounting possible determinants in the relationship between climate change and conflict.

Conversely, opportunities for conflict avoidance are not universally successful. Investigating *resource abundance*, Spijkers and Boonstra's case study of the mackerel dispute between the European Union, Norway, Iceland, and the Faroe Islands over fishing quotas began and endured despite a legal framework for sharing and conserving marine resources.[27] The mechanisms for allocation failed to promote agreement on the principles to be applied or the calculation of quotas, knowledge-based scientific information was contested, and there was an imbalance of power between the parties. The

[18] Thomas Homer-Dixon, 'Environmental Scarcities and Violent Conflict: Evidence from Cases', *International Security* 19, no. 1 (1994): 5–40.

[19] Von Uexkull and Buhaug, 'Security Implications of Climate Change'.

[20] Cody Schmidt, Bomi Lee, and Sara McLaughlin Mitchell, 'Climate Bones of Contention: How Climate Variability Influences Territorial, Maritime, and River Interstate Conflicts', *Journal of Peace Research* 58, no. 1 (2021): 132–50.

[21] Colleen Devlin and Cullen Hendrix, 'Trends and Triggers Redux: Climate Change, Rainfall, and Interstate Conflict', *Political Geography* 43 (2014): 27–39.

[22] Thomas Bernauer and Tobias Böhmelt, 'International Conflict and Cooperation over Freshwater Resources', *Nature Sustainability* 3, no. 5 (2020): 350–56.

[23] Nils Petter Gleditsch, 'This Time is Different! Or is it? NeoMalthusians and Environmental Optimists in the Age of Climate Change', *Journal of Peace Research* 58, no. 1 (2021): 177–85.

[24] Gartzke, 'Could Climate Change Precipitate Peace?'

[25] Jaroslav Tir and Douglas Stinnett, 'Weathering Climate Change: Can Institutions Mitigate International Water Conflict?', *Journal of Peace Research* 49, no. 1 (2012): 211–25.

[26] Vally Koubi, Gabriele Spilker, Tobias Böhmelt, and Thomas Bernauer, 'Do Natural Resources Matter for Interstate and Intrastate Armed Conflict?', *Journal of Peace Research* 51, no. 2 (2014): 227–43.

[27] Jessica Spijkers and Wiebren Boonstra, 'Environmental Change and Social Conflict: The Northeast Atlantic Mackerel Dispute', *Regional Environmental Change* 17, no. 6 (2017): 1835–51.

threat of spillover to agreements concerning other marine species eventually resulted in a bargain that favoured Norway.

Despite its achievements, the narrow research focus based on grievance related to resource scarcity,[28] and equivocal findings, leaves considerable scope for future research. Outstanding research questions concern the role and importance of other variables in understanding long-term variations in interstate conflict. There is also a case for expanding the motivations for conflict, in particular, greed. In any case, given the multiple stressors resulting from climate change occurring together, and their interactions, the unique risk they pose to interstate conflict demands an orientation relevant to security policymakers.

Directions for future research

Drawing on the literature just considered, I will now propose directions for future research that may assist policymakers to anticipate international tensions caused by climate change. If climate change simultaneously causes a rise in sea levels, lower agricultural yields, more frequent natural disasters, more and larger migration flows, and more stress on government resources, it is their simultaneous impact that is most relevant to security policymakers.[29] As the magnitude of climate change effects increases, however, past relationships are less likely to be relevant, magnifying uncertainties and conflict risk.[30] Scenario forecasting offers a theoretical option for examining future security issues although they will tend to be more speculative.[31] Moreover, major climate impacts could be felt simultaneously around the world, unlike conventional security threats that involve few states at a specific point in time.[32] The possibility of large-scale climate-induced migration likely to affect relations between states should be included in forecasts.[33] Future research could also examine greed as a motivator in the Arctic.[34] Contestation over non-renewable resources or protection of new shipping routes as a result of the ice melt has implications for military assets and personnel as well as new security vulnerabilities.[35]

In the long run, international governance institutions and changes in the world order will moderate the risk of armed conflict.[36] Climate-induced limits to a state's capacity to deter rivals by, say, diverting government resources away from security assets in order to cover the costs of severe weather events at home, could influence the incidence and duration of future interstate conflict.[37] The redistribution of power across states, as economic power shifts away from states with significant non-renewable resources and towards states with renewable resources or the inputs for clean energy technologies,[38] could see the former states lose leverage and suffer economic losses[39] creating new arenas for conflict. The possible impact on exclusive economic zones from loss of territory with rising sea levels could also have implications for world order. In understanding changes in geopolitical power, researchers should revisit the perception of threats emanating from these non-traditional sources, with a role for psychology in cross-disciplinary research.[40]

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[28] Gleditsch, 'This Time is Different! Or is it?'

[29] Von Uexkull and Buhaug, 'Security Implications of Climate Change'.

[30] Mach et al., 'Climate as a Risk Factor for Armed Conflict'.

[31] Joshua Busby, 'Taking Stock: The Field of Climate and Security', *Current Climate Change Reports* 4, no. 4 (2018): 338–46.

[32] CNA, *National Security and the Threat of Climate Change* (CNA Corporation, 2007).

[33] Ole Sending, Indra Øverland, and Thomas Boe Hornburg, 'Climate Change and International Relations: A Five-Pronged Research Agenda', *Journal of International Affairs* 73, no. 1 (2019): 183–94.

[34] Koubi, 'Climate Change and Conflict'.

[35] Joshua Goldstein, 'Climate Change as a Global Security Issue', *Journal of Global Security Studies* 1, no. 1 (2016): 95–98.

[36] Mach et al., 'Climate as a Risk Factor for Armed Conflict'.

[37] Emilio Morales, 'Global Climate Change as a Threat to U.S.', *Journal of Strategic Security* 8, no. 5 (2015): 134–48.

[38] Sending, Øverland, and Hornburg, 'Climate Change and International Relations: A Five-Pronged Research Agenda'.

[39] Marie Dejonghe, 'Will Only a Green Power Remain Great Power?'

[40] Se Min Suh, Daniel Chapman, and Brian Lickel, 'The Role of Psychological Research in Understanding and Responding to Links between Climate Change and Conflict', *Current Opinion in Psychology* 42 (2021): 43–48.

Extending current research on risk reduction interventions also has merit.[41] Without attempts to collaboratively manage approaching water shortages in South Asia where several states with large populations rely on water from the contracting Himalayan glaciers,[42] armed conflict may quickly follow from old antagonisms. Similar issues apply in other regions.[43] Investing in conflict-mitigation mechanisms and institutional capacity with neighbouring states orients the parties towards cooperation.[44] At the same time, new pathways to interstate conflict could arise from disagreements concerning mitigation or compensation for the shared resources[45] or the unintended consequences of adaptive responses.

To summarise what we have learned about climate change and interstate conflict in the past decade, I have shown that the risk of conflict from climate change, while small at present, appears likely to escalate with global warming. Second, I have argued that thus far, our understanding of the impact of climate change on conflict/peace is modest. The array of determinants of conflict, their relative strength, and their interactions with climate change, render it difficult to study and achieve consensus on the relationships. Nevertheless, as major climate effects are experienced more widely and frequently, a compelling case has been made for increased attention to the non-traditional security threat from climate change.

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[41] Mach et al., 'Climate as a Risk Factor for Armed Conflict'.

[42] Michael Klare, 'Climate Change, Water Scarcity, and the Potential for Interstate Conflict in South Asia', *Journal of Strategic Security* 13, no. 4 (2020): 109–22.

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