



The Hague Centre
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Unpacking the Climate Security Nexus

Seven Pathologies Linking Climate Change to Violent Conflict

Tim Sweijs, Marleen de Haan, Hugo van Manen

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Authors*

Tim Sweijs, Marleen de Haan, Hugo van Manen

Contributors**

Prof Dr. Vally Koubi, Prof Dr. Mark Nevitt, Rolien Bergsasse, Peter Rowan,
Nina Mason

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Johnson Space Center of the United States National Aeronautics and Space Administration (NASA).

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* All authors contributed equally to this paper.

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Abstract

Although acceptance of climate change's role as a 'threat multiplier' is, by now, widespread, the specific causal mechanisms linking climate change to (violent) conflict onset remain under researched. Formal descriptions of the causal mechanisms remain few and far between. This is not problematic only for scientific reasons. The obscurity surrounding climate change's links to violent conflict also hinders the development of targeted policy interventions at a time when the impact of such conflict is on the uptick.

Although climate-related conflicts are complex, extant conflict research suggests that structural patterns can be discerned across cases. This study presents seven climate-related conflict pathologies (see Table 1 below). A climate-related conflict pathology is defined as the specific pathway through which interaction between climate change and social, economic, and political factors leads to violent conflict. For each pathology, the study identifies the relevant factors, describes how they interact with one another, and elucidates the pathways through which they lead to violent conflict. The study also highlights regions that are particularly prone to each pathology and evaluates the available evidence and the degree of scientific consensus surrounding each of them.

Table 1. Climate-Related Conflict Pathologies



| # | Pathology description | |
|---|---------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Climate change-related resource scarcity leads to conflict between pastoralist and sedentary communities | Changes in temperature and precipitation cause forms of scarcity that force pastoralist groups to alter their transhumance routes. This precipitates resource competition between groups, infringes on traditional customary regulations, and increases conflict risk. |
| 2 | Climate change-related resource scarcity leads to larger-scale inter-communal violence | Climate change-induced scarcity of water, food, and land resources, in combination with social, political, geographic, and economic variables, can trigger inter-communal tensions. |
| 3 | Climate change precipitates (internal) migration, leading to social unrest | Climate change can lead to migration, whether from rural to urban areas or between rural areas. This can spark social unrest by increasing resource competition and exacerbating feelings of relative deprivation, as well as the severity of inter-cultural clashes. |
| 4 | Climate change-related social unrest empowers nonstate armed groups | Climate change interacts with state fragility and contributes to livelihood deterioration, creating fertile ground for the emergence and expansion of non-state armed groups (NSAGs). |
| 5 | Policies aimed at mitigating the effects of climate change have adverse effects | Climate change policies can trigger political exploitation and marginalization of groups, aggravating existing grievances and tensions. |
| 6 | Climate change-related social unrest precipitates large-scale political movements, provoking a government crackdown | Climate hazards can provoke a window of opportunity for violent and non-violent opposition to further undermine authorities. This erodes state capacity and exacerbates social vulnerability. Conflict arises as a result of the state's (violent) crackdown on dissent. |
| 7 | Disputes over transboundary resources cascade into interstate conflict | Climate change can foster tensions over transboundary resources in three main ways: 1) water scarcity raises tensions over transboundary freshwater resources; 2) temperature increases create a new frontier for disputes in the Arctic; 3) diplomatic disputes over climate mitigation measures and responsibility. |

The climate-related conflict pathologies have been identified based on an in-depth literature review. Publications were selected based on a set of qualitative and quantitative criteria, including an appraisal of the overall quality of the research (robust empirical evidence combined with an articulated theory specifying the relationship between independent and dependent variables); the impact factor of the journal in which the publication appeared; the number of citations each article received (with more recent research being prioritized); and geographical coverage.

The climate-related conflict pathologies contribute to the literature in two principal ways. First, because its findings are based on a synthesis of a large and diverse body of literature, it is more comprehensive in the range of pathologies it covers than existing publications. Second, through the provision of granular descriptions of each pathology, this piece helps to address several ongoing discussions regarding climate change's (indirect) link to conflict within the academic community. The combination of these contributions provides a springboard both for future research and for the development of climate security policies

For future research, it facilitates the formulation and subsequent testing of more specific climate-related conflict hypotheses. It also allows for the development of a deeper understanding of how pathologies feed into one-another. Most importantly, the individual pathologies can be further refined and corroborated using various methods and analytical techniques. In depth case studies involving desk data analysis, field surveys, stakeholder interviews and process tracing, can be applied in conjunction with quantitative methodological approaches to formally test and corroborate the causal mechanisms described in these pathologies.

For policymaking, this study also offers relevant insights. The mediating factors associated with each of the climate-related conflict pathologies outlined in this paper can be actively targeted to proactively reduce the risk of climate change resulting in the onset of conflict in vulnerable states.

1. Introduction

Concerns about the climate security nexus have firmly entered mainstream national and international policy discourses.

Climate change's indirect relationship to violent conflict and instability has, by and large, achieved mainstream adoption.¹ The security effects of climate change have been described and corroborated at both the macro and micro-levels across disciplines ranging from political science, conflict studies, anthropology, and development studies.² In parallel, concerns about the climate security nexus have firmly entered mainstream national and international policy discourses. During the Fifth UN Security Council (UNSC) debate on climate-security risks and responses in the summer of 2020, UN Assistant Secretary-General Miroslav Jenča pointed out that the “failure to consider the growing impacts of climate change will undermine our efforts at conflict prevention, peace-making and sustaining peace, and risk trapping vulnerable countries in a vicious cycle of climate disaster and conflict.”³ Progress towards acknowledging and addressing climate change's indirect link to violent conflict within the UN has since experienced a setback. On 13 December 2021, an Ireland and Niger-spearheaded UNSC resolution calling for a redoubling of international efforts to understand and respond to climate change's implications for peace and security was vetoed by Russia.⁴

While the existence of an indirect relationship between climate change and the increased likelihood of conflict is clearly acknowledged in academic and policymaking communities, the specific causal mechanisms at work remain underexplored.⁵ Climate change is often described as a ‘threat multiplier’ that aggravates existing political or socio-economic

- 1 See for example Kendra Sakaguchi, Anil Varughese, and Graeme Auld, ‘Climate Wars? A Systematic Review of Empirical Analyses on the Links between Climate Change and Violent Conflict’, *International Studies Review* 19, no. 4 (2017): 622–45; Kurt M. Campbell and Christine Parthemore, ‘National Security and Climate Change in Perspective’, *Climatic Cataclysm: The Foreign Policy and National Security Implications of Climate Change*, 2008, 1–25; Mark Nevitt, ‘What You Need to Know About The New Climate Change Security Reports’, SSRN Scholarly Paper (Rochester, NY: Social Science Research Network, 26 October 2021), <https://doi.org/10.2139/ssrn.4005606>; Mark Nevitt, ‘The Climate-Security Century: Three Climate Hotspots’, SSRN Scholarly Paper (Rochester, NY: Social Science Research Network, 11 August 2021), <https://papers.ssrn.com/abstract=3903318>; Mark Nevitt, ‘Is Climate Change a Threat to International Peace and Security?’, *Michigan Journal of International Law* 42 (2021), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3689320. See also Jürgen Scheffran and Antonella Battaglini, ‘Climate and Conflicts: The Security Risks of Global Warming’, *Regional Environmental Change* 11, no. 1 (2011): 27–39; Jürgen Scheffran et al., ‘Climate Change and Violent Conflict’, *Science (Washington)* 336, no. 6083 (2012): 869–71.
- 2 See for example: Thomas F. Homer-Dixon, *Environment, Scarcity, and Violence* (Princeton, N.J.: Princeton University Press, 1999); Solomon M. Hsiang, Marshall Burke, and Edward Miguel, ‘Quantifying the Influence of Climate on Human Conflict’, *Science* 341, no. 6151 (13 September 2013); Katharine J. Mach et al., ‘Climate as a Risk Factor for Armed Conflict’, *Nature (London)* 571, no. 7764 (2019): 193–97. Colin P. Kelley et al., ‘Climate Change in the Fertile Crescent and Implications of the Recent Syrian Drought’, *Proceedings of the National Academy of Sciences* 112, no. 11 (17 March 2015): 3241–46; Rikhil R. Bhavnani and Bethany Lacina, ‘The Effects of Weather-Induced Migration on Sons of the Soil Riots in India’, *World Politics* 67, no. 4 (2015): 760–94.
- 3 United Nations Security Council, ‘Maintenance of International Peace and Security: Climate Security’, July 2020.
- 4 Rick Gladstone, ‘Russia Blocks U.N. Move to Treat Climate as Security Threat’, *The New York Times*, 13 December 2021, sec. World, <https://www.nytimes.com/2021/12/13/world/americas/un-climate-change-russia.html>.
- 5 Though some notable exceptions exist. See for example Sophie de Bruin et al., ‘Linking Water Security Threats to Conflict: An Exploration of Pathways’ (The Hague: PBL Netherlands Environmental Assessment Agency, 2018), https://www.pbl.nl/sites/default/files/downloads/3039_Linking_water_security_threats_to_conflict_DEF.pdf; Sophie P. de Bruin et al., ‘Projecting Long-Term Armed Conflict Risk: An Underappreciated Field of Inquiry?’, *Global Environmental Change* 72 (1 January 2022): 102423, <https://doi.org/10.1016/j.gloenvcha.2021.102423>.

While climate-related conflicts are complex, extant conflict research suggests that structural patterns can be discerned across case studies.

tensions and causes them to ultimately cascade into conflict.⁶ Despite the fact that there is a rich variety of in-depth case analyses and larger n-studies documenting the relationship, researchers have traditionally shied away from providing an overall account of the interaction between different variables, let alone from making causal inferences in the climate-security nexus. As Homer Dixon, one of the founders of environmental security research, himself stated, he sought to “avoid entangling [himself] in the metaphysical debate about the relative importance of causes” due to the unmanageable task of distinguishing between different causal factors.⁷ Although studies have explored pathways linking climate change to conflict since the 1990s, and climatological variables are now used in conflict early warning models,⁸ a *comprehensive* formal description of the causal mechanisms remains lacking.⁹ This is not only problematic for scientific reasons; it also inhibits the development of targeted policy interventions and could potentially lead to the implementation of counter-effective policies.¹⁰

It is therefore important to understand *how*, and under what circumstances, climatological factors interact with social, political, and economic factors to induce violent conflict.¹¹ While climate-related conflicts are complex, extant conflict research suggests that structural patterns can be discerned across case studies.

This study draws on an extensive literature review of the climate change and conflict literature to present seven climate-related conflict pathologies – archetypical descriptions of unique combinations of generalizable climate-related, social, economic, and political variables that explain the onset of various forms of violent conflict. It is important to note that, due to the limitations of literature review-based research methods, the list of pathologies outlined in this publication are possibly not comprehensive in their scope. Previous research into climate change’s link to violent conflict has overrepresented the Middle East, North Africa, Sahel, and South-East Asia regions, and may not be applicable to – or representative of – all other world regions. Moreover, new forms of climate-related conflict, none of which are described in existing literature, are likely to emerge in the future. As a result, the pathologies outlined in this publication can be better understood as a description of seven *potential* pathways through which climate change may affect violent conflict rather than a timeless, comprehensive overview of climate-related conflict pathologies.

This report proceeds as follows: the next section discusses the concept of a climate-related conflict pathology, describes the literature review approach, and highlights potential biases in the literature. The section after that outlines each of the seven identified pathologies. It offers

6 Term introduced by: The CNA Military Advisory Board, ‘National Security and the Threat of Climate Change’, 2007; See also: Matt McDonald, ‘Discourses of Climate Security’, *Political Geography* 33 (2013): 44.

7 Thomas F. Homer-Dixon, *Environment, Scarcity, and Violence*, 7.

8 As part of the Water Peace Security (WPS) Programme, our team at the The Hague Centre for Strategic Studies (HCSS) has co-developed the Global Early Warning Tool, a forecasting tool which deploys machine learning models that leverage a range of environmental, social, economic and political data, to generate forecasts of future climate change related conflict at the sub-national (district) level in the upcoming 12 months with a past performance of 86% accuracy. See Samantha Kuzma et al., ‘Leveraging Water Data In A Machine Learning-Based Model For Forecasting Violent Conflict’ (World Resources Institute, February 2020).

9 See Halvard Buhaug, ‘Global Security Challenges of Climate’ (Peace Research Institute Oslo, August 2018), 5; Halvard Buhaug, ‘Climate–Conflict Research: Some Reflections on the Way Forward’, *WIREs Climate Change* 6, no. 3 (2015): 269–75; Idean Salehyan, ‘Climate Change and Conflict: Making Sense of Disparate Findings’, *Political Geography*, Special Issue: Climate Change and Conflict, 43 (1 November 2014): 1–5. See also Peter Gleick, Charles Iceland, and Ayushi Trivedi, ‘Ending Conflicts Over Water’, 2020.

10 Conclusion drawn by Halvard Buhaug, ‘Global Security Challenges of Climate’, 8. Lars-Erik Cederman and Nils B. Weidmann, ‘Predicting Armed Conflict: Time to Adjust Our Expectations?’, *Science* 355, no. 6324 (3 February 2017): 474–76.

11 Ole Magnus Theisen, Helge Holtermann, and Halvard Buhaug, ‘Climate Wars? Assessing the Claim That Drought Breeds Conflict’, *International Security* 36, no. 3 (2011): 79–106.

a discussion of the structural factors that mediate the climate-conflict link, the regions that are most at risk of being affected by the pathology, the type of conflict it most typically engenders, and the degree of consensus that exist within the literature surrounding its pathology. The final section provides reflections on the set of pathologies and outlines how they can be used in future research.

This study is part of a larger research project to better understand the causal dynamics of the climate-security nexus. As part of this project, an in-depth causal model will be developed for one climate change-related conflict pathology based on causal modeling and field research later this year.¹²

¹² Causal modeling is a quantitative methodology that extracts causal dynamics from within a system of variables, identifies pathways that may constitute causal relations, and quantifies their effects.

2. Methodology

Climate-Related Conflict Pathologies

This study uses the concept of a climate-related conflict pathology. The term “pathology” originates from within the medical field, where the Oxford Dictionary refers to it as the “science of the causes and effects of diseases,” the “typical behavior of a disease,” or a “pathological condition”.¹³ The term is also commonly referred to within the field of mathematics, where it describes an object which “possesses deviant, irregular properties, that make it different from a typical object in the same category.”¹⁴ Both definitions offer relevant handles for applying the concept to the relationship between climate change and violent conflict. First and foremost, the term’s association with disease and with abnormalities in the medical and mathematical fields respectively highlights its relationship to a negative or irregular outcome. Second, the definitions’ reference to “cause,” “typical behavior,” and “properties” indicates that a “pathology” describes the factors and the pathways leading up to and the characteristics of the negative outcome. A climate-related conflict pathology is therefore defined as the specific pathway through which interaction between climate change and social, economic, and political factors leads to violent conflict.

The concept of a climate-related conflict pathology is not entirely new even if the term as such has – to our knowledge – not been previously coined. Four relevant and relatively recent overviews of the climate-conflict nexus that attempt to disentangle the climate-conflict nexus into comprehensive pathologies are offered by Rüttinger et al. (2015),¹⁵ Koubi (2019),¹⁶ Mobjörk, Krampe, and Tarif (2020),¹⁷ and Ide et al. (2016).¹⁸ The pathologies described by these authors are outlined in Table 2 below.¹⁹

13 Oxford Dictionary, ‘Meaning of Pathology in English’, Lexico, 2021, <https://www.lexico.com/definition/pathology>.

14 Math Vault, ‘The Definitive Glossary of Higher Math Jargon’, 1 August 2019, <https://mathvault.ca/math-glossary/>.

15 Lukas Rüttinger et al., ‘A New Climate for Peace: Taking Action on Climate and Fragility Risks’, 2015, https://climate-diplomacy.org/sites/default/files/2020-11/NewClimateForPeace_FullReport_small_0.pdf.

16 Vally Koubi, ‘Climate Change and Conflict’, *Annual Review of Political Science* 22, no. 1 (2019): 343–60, <https://doi.org/10.1146/annurev-polisci-050317-070830>.

17 Malin Mobjörk, Florian Krampe, and Kheira Tarif, ‘Pathways of Climate Insecurity: Guidance for Policymakers’ (SIPRI, November 2020).

18 Tobias Ide et al., ‘The Climate-Conflict Nexus: Pathways, Regional Links and Case Studies’, in *Handbook on Sustainability Transition and Sustainable Peace* (Springer, 2016).

19 Other academic literature reviews are offered by: Halvard Buhaug, ‘Climate Change and Conflict: Taking Stock’, *Peace Economics, Peace Science and Public Policy* 22 (1 October 2016), <https://doi.org/10.1515/peps-2016-0034>; Thomas F. Homer-Dixon, ‘On the Threshold: Environmental Changes as Causes of Acute Conflict’, *International Security* 16, no. 2 (1991): 76–116. For more-policy oriented reviews on the climate-conflict nexus see for example: Kate Peters et al., ‘Climate Change, Conflict and Fragility: An Evidence Review and Recommendations for Research and Action’ (Overseas Development Institute, June 2020); Beatrice Mosello, Lukas Rüttinger, and Liesa Sauerhammer, ‘The Climate Change-Conflict Connection: The Current State of Knowledge’ (Climate-Security Expert Network, 12 November 2019).

Table 2. Overviews of Climate-Conflict Literature

| Source | Pathologies and Pathways | |
|----------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Rüttinger et al (2015) <i>A New Climate for Peace</i> | <ol style="list-style-type: none"> 1. Climate change-induced scarcity fosters local resource competition, creating a situation which may spiral into conflict. 2. Climate change creates livelihood insecurity. This precipitates large-scale migration, overwhelming existing institutions and resulting in instability. 3. Extreme weather events and disasters displace individuals, damage infrastructure, and undermine institutions. This leads to the development of fragile situations. 4. Climate change-induced events negatively impact agricultural output. This causes food prices to rise, contributing to social unrest. 5. Scarcity in transboundary resources leads to disputes between parties seeking to manage them, particularly in dyads where no treaties govern state conduct relating to said resources. 6. Sea-level rise and coastal degradation threaten livelihoods and incentivize migration, overwhelming existing institutions and resulting in instability. 7. Unintended effects of climate policies exacerbate tensions. | |
| Koubi (2019) <i>Climate Change and Conflict</i> | Direct Pathway | Physiological and psychological factors, combined with resource scarcity, fuel interpersonal violence and inter-group conflict. |
| | Indirect Pathway | <p>Climate change-induced decline of economic output can lead to loss of income, food provisioning, price volatility, and reduced government income. This can trigger social unrest.</p> <p>Climate change can cause migration. This can increase resource competition in areas experiencing an influx and stir up ethnic tensions.</p> |
| Mobjörk, Krampe, and Tarif (2020) <i>Pathways of Climate Insecurity</i> | <ol style="list-style-type: none"> 1. Worsening livelihood conditions; 2. Increases in migration and changes in migration patterns; 3. Tactical considerations by armed groups, and; 4. Exploitation by elites and resource mismanagement. | |
| Ide et al. (2016) <i>The Climate-Conflict Nexus: Pathways, Regional Links and Case Studies</i> | <ol style="list-style-type: none"> 1. Changes in temperature; 2. Reductions in precipitation; 3. Increase in extreme precipitation and in the variability of precipitation patterns; 4. Changes in the availability of freshwater; 5. Land degradation; 6. The onset of climate-related natural disasters, and; 7. Other pathways. | |

The climate-related conflict pathologies outlined in this study improve on their contributions to the literature in two major ways. First, they are more comprehensive in the range of pathologies that they cover. Rüttinger et al. (2015) offer a thorough overview of climate-related conflict pathologies, discussing important contextual and structural variables. Koubi (2019) provides a meticulous assessment of the existing quantitative evidence, and to a lesser degree the qualitative evidence, on climate-related conflict pathologies. Although different pathways are also identified by Mobjörk, Krampe, and Tarif (2020), their research is first and foremost focused on informing policymakers rather than on providing a state-of-the-art overview of the academic evidence. Ide et al. (2016) provide a clear overview of different climate-stressors that could influence conflict, but their operationalization of conflict does not distinguish between different types of violent conflict. By expanding the scope of the literature under review beyond what is described in these authors' publications, this study identifies and endeavors to describe a more comprehensive set of pathologies, input factors, and outcomes.

Second, they make a direct contribution to ongoing discussions within the academic community on indirect pathways leading from climate change to conflict by providing more granular descriptions of the causal mechanisms that lead to different forms of conflict. The body of evidence linking climate directly to violent conflict is conflicting. This has

problematized the formation of a clear consensus. Identifying, correcting for, and introducing mediating factors allows this study to propose pathologies can help address conflicting findings in this field. In the climate-conflict literature, *conflict* is delineated in many different ways, ranging from individual violent acts (murder, robbery, etc.)²⁰ to inter-state conflict.²¹ With the clear exception of Koubi (2019), this is not always adequately corrected for in publications which strive to outline pathways.²² Koubi (2019) highlights that conflict is operationalized in different manners and provides a non-comprehensive description of relevant (indirect) causal mechanisms linking climate change to conflict. The typologies offered in this paper expand on Koubi's and others' work by supplementing the pathologies and the causal mechanisms they identify with those described in the broader literature. This results in the formulation of a set of seven possible climate-related conflict pathologies to explain the onset of various types of conflict, many of which other studies typically conceptualize as n^{th} -order effects of climate change.

Literature Review Approach

The climate-related conflict pathologies were identified based on an in-depth literature review. The literature review does not satisfy all the criteria for a comprehensive literature review, since, for budget and time-related reasons, the research team could not review all possibly relevant literature available within the field. Nonetheless, the research team is confident that the applied methodology was sufficiently exhaustive to cover the spectrum of climate-conflict research and relevant evidence on climate-related conflict pathologies. The list of works consulted is included in Annex II.

A climate-related conflict keyword search of both Google Scholar and the Leiden University Academic Library repositories were used to identify articles. Search terms used (*"climate change" AND conflict*), (*environment AND conflict*), and (*"climate change" AND violence*).²³ The resulting thousands of publications were subsequently shortlisted. The criteria included an appraisal of the overall quality of the research based on a combination of whether a theoretical framework was used that spelled out the relationship between climate change and violent conflict, and whether it relied on empirical research to assess that relationship (irrespective of whether this was quantitative or qualitative in nature); the impact factor of the journal in which the publication appeared; the number of citations the article received; and the date of publication, with more recent research being prioritized.²⁴ Because some climate-related conflict pathologies and regions were underrepresented (see below), the team made sure to add articles that met the substantive criteria even if they scored comparatively lower on citation metrics.

20 For example: Dennis M. Mares and Kenneth W. Moffett, 'Climate Change and Interpersonal Violence: A "Global" Estimate and Regional Inequities', *Climatic Change* 135, no. 2 (2016): 297–310, <https://doi.org/10.1007/s10584-015-1566-0>.

21 For example: Colleen Devlin and Cullen S. Hendrix, 'Trends and Triggers Redux: Climate Change, Rainfall, and Interstate Conflict', *Political Geography* 43 (2014): 27–39, <https://doi.org/10.1016/j.polgeo.2014.07.001>.

22 This is largely true for macro-level studies such as Koubi (2019), but is not true of several previously published micro-level studies. As an example, Raleigh (2015) provides an in-depth overview of the relationship between climate change, food prices, and (sub)national conflict. See Clionadh Raleigh, Hyun Jin Choi, and Dominic Kniveton, 'The Devil Is in the Details: An Investigation of the Relationships between Conflict, Food Price and Climate across Africa', *Global Environmental Change* 32 (1 May 2015): 187–99, <https://doi.org/10.1016/j.gloenvcha.2015.03.005>.

23 Annex 1 provides an overview of the search terms used, see Annex 1 Boolean Search Terms.

24 The average number of citations for the articles covered by this study is 260. The median is 95. The minimum number of citations is 1 and the maximum number of citations is 2015. 70% of included articles have 30 or more citations and 60% have more than 50. For a full overview of the articles consulted, please see Annex II.

The climate-related conflict pathologies were identified based on an in-depth literature review.

This resulted in a total of 92 articles being included in the final analysis. Selected articles were published between 1983-2021, a timeframe which is representative of environmental security research, with the first climate-conflict literature stemming from the early 1980s. Though this literature review was not designed to distinguish between disciplines, the keywords used to identify publications resulted in political science, conflict studies, anthropological and development studies being prominently represented. The authors assess that this set of disciplines accurately represents the broader field of environmental security research. The political science field discusses the state-of-the-art of the overall body of literature. Conflict studies identify the climate-conflict link and the variables at play between climate change and conflict more closely. Anthropology and development studies typically provide more case-based accounts of the climate-security relationship.

On the basis of this sample, the team mapped existing pathways. Articles were initially sorted based on how they operationalized conflict and the social, political, and economic variables they outlined. Each article was subsequently analyzed for mediating factors that interacted with climate change to contribute to conflict onset, the specific pathway by which they do so, the type of conflict initiated, and the geographical regions in which these pathologies were prevalent. As the information presented in publications was analyzed and coded, researchers determined whether it fit an existing pathology, whether an existing pathology needed to be broadened, generalized, or expanded, on to accommodate a specific case study, or whether a case study warranted the formulation of an altogether new and unique pathology. Proceeding in this way, the team identified seven pathologies (see Table 3) which are described in the following section.

Table 3. Seven Climate-Related Conflict Pathologies



| # | Pathology description | |
|---|----------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Climate change-related resource scarcity leads to conflict between pastoralist and sedentary communities | Changes in temperature and precipitation cause forms of scarcity that force pastoralist groups to alter their transhumance routes. This precipitates resource competition between groups, infringes on traditional customary regulations, and increases conflict risk. |
| 2 | Climate change-related resource scarcity leads to larger-scale inter-communal violence | Climate change-induced scarcity of water, food, and land resources, in combination with social, political, geographic, and economic variables, can trigger inter-communal tensions. |
| 3 | Climate change precipitates (internal) migration, leading to social unrest | Climate change can lead to migration, whether from rural to urban areas or between rural areas. This can spark social unrest by increasing resource competition and exacerbating feelings of relative deprivation, as well as the severity of inter-cultural clashes. |
| 4 | Climate change-related social unrest empowers nonstate armed groups | Climate change interacts with state fragility and contributes to livelihood deterioration, creating fertile ground for the emergence and expansion of non-state armed groups (NSAGs). |
| 5 | Policies aimed at mitigating the effects of climate change have adverse effects | Climate change policies can trigger political exploitation and marginalization of groups, aggravating existing grievances and tensions. |
| 6 | Climate change-related social unrest precipitates large-scale political movements, provoking a government crackdown | Climate hazards can provoke a window of opportunity for violent and non-violent opposition to further undermine authorities. This erodes state capacity and exacerbates social vulnerability. Conflict arises as a result of the state's (violent) crackdown on dissent. |
| 7 | Disputes over transboundary resources cascade into interstate conflict | Climate change can foster tensions over transboundary resources in three main ways: 1) water scarcity raises tensions over transboundary freshwater resources; 2) temperature increases create a new frontier for disputes in the Arctic; 3) diplomatic disputes over climate mitigation measures and responsibility. |

Caveats

The methodology used to identify the seven pathologies has several important pitfalls. First and foremost, the source material is overwhelmingly Africa, Middle East, and South-East Asia-centric. The regional bias in the literature may well be the product of a so-called street-light effect in which researchers focus their efforts a.) on places that are easily accessible, and b.) on places in which climate change's indirect link to violent conflict is observable, or has been in the past. In particular, researchers have been shown to gravitate towards former British colonies, where English was amongst the official languages.²⁵ The literature's focus on Africa, the Middle East, and South-East Asia is likely to have resulted in the identification of pathologies that describe climate-related pathways to conflict specifically in these regions. By the same token, this study's dependence on preexisting literature means it is likely to reflect other (under)representations, too. This includes a possible underrepresentation or omission of existing pathologies which have simply not been described, the omission of key (micro-level) mediating factors, and – crucially – the identification of a series of pathologies which does not necessarily account for future scenarios. To correct for these shortcomings in the literature, the research team specifically sought to include articles and grey literature which turn their eye on climate-conflict dynamics in different world regions.

Second, the research does not discuss the extent to which these pathologies are inter-related. Rather than a linear pathway from point A to point B, these pathologies represent complex feedback loops in which one stressor impacts, but is also impacted by, conflict. As an example, the water scarcity caused by climate change can be exacerbated by conflict initiation because it can disrupt public services, empower non-state actors, or lead to the destruction of infrastructure. In all cases, authorities' ability to manage water supplies is eroded or suspended, with macro-level access to the resource suffering as a result.

Different types of conflict can also cascade into one another. In this study, a decision has been made to differentiate between different climate-related conflict logics in order to capture the wide gamut of pathologies described in the existing literature on the one hand and to maintain readability and ease of understanding on the other. This means that these cascade effects are not always comprehensively captured in the pathologies themselves, though references to these dynamics are provided when relevant.

The literature's focus on Africa, the Middle East, and South-East Asia is likely to have resulted in the identification of pathologies that describe climate-related pathways to conflict specific to these regions.

25 Courtland Adams et al., 'Sampling Bias in Climate–Conflict Research', *Nature Climate Change* 8, no. 3 (March 2018): 200–203, <https://doi.org/10.1038/s41558-018-0068-2>.

3. Climate-Related Conflict Pathologies

The impact on conflict that results from climatic changes depends on contextual social, economic, and political factors.

The link between climate and conflict is complex and multifaceted. Different climate-related changes, including slow-onset changes such as drought, temperature increase, and rapid-onset climate hazards such as flooding and storms, can have an impact on conflict. The impact on conflict, including the specific type of conflict, that results from climatic changes, in turn, depends on contextual social, economic, and political factors. In a country that is relatively stable and where the state can cope with the impact of climate change and climatic hazards, the likelihood of climate change precipitating a cascade into violent conflict is limited. In fragile states, however, the climate is likely to exacerbate existing vulnerabilities and induce conflict. This chapter outlines the principal seven climate-related conflict pathologies that have been derived from the literature review to give an overview of the ways in which climate change can induce conflict. The sections are structured as follows: the first paragraph in each pathology sets out its core logic and summarizes the structural factors influencing the climate-conflict relationship that have been identified in the literature. This paragraph also mentions world regions that are at risk of the pathology and offers insights into the degree of consensus the evidence on this specific pathology provides. The section continues with a more in-depth discussion of the climate-related conflict pathology and offers relevant references in the footnotes. It concludes with a summary of the different conflict outcomes.

Box 1. Reading Guide Pathologies

The pathologies outlined in the following section are, as outlined in the method section, derived from an in-depth review of existing literature. As a consequence, they are likely to underrepresent a.) pathologies applying to regions outside of the Africa, the Middle East, and South-East Asia, b.) pathologies which have simply not been described, c.) key (micro-level) mediating factors, 4.) future climate-conflict related pathologies.

Though this research team has opted to structure its findings through the formulation of seven climate-related conflict pathologies, it is important to note that many – if not all – of the climate-related conflict pathologies outlined in this section are interrelated may, under some circumstances, cascade into one another. As an example, it is thinkable that a conflict between agriculturalist and sedentary communities might escalate into larger-scale inter-communal conflict by inflaming tribal tensions, that the resulting conflict might contribute to a mass migration into urban areas, a legitimization of NSAGs, social unrest, and – ultimately – a violent government crackdown, civil war, and the prolonged participation of international actors in the conflict. But while the research team acknowledges that such a scenario is thinkable, and though – by this logic – many of the pathologies outlined in this piece could be conceptualized as being one pathology, it pays to note that the aforementioned escalation chain is far from universally applicable. Each of the pathologies outlined in this piece can (and have) occurred within a vacuum, meaning that they have not manifested as a result of one pathology cascading into another.

To address this problem – the pathologies both are and are not directly linked to one another, depending on context – the research team has structured them in such a way that the escalation chain through which they might typically cascade into one another is clearly captured. It has done so by sorting pathologies by their place in the aforementioned escalation chain, with pathology 1 (climate change-related resource scarcity leads to conflict between agriculturalist and sedentary communities) being the first step in that chain and pathology 7 (disputes over transboundary resources cascade into intrastate conflict) being the last. While limited references are made in-text to each pathologies' relationship to those which precede and succeed it, readers are encouraged to be mindful of this.

Pathology 1:

Climate Change-Related Resource Scarcity Leads to Conflict Between Pastoralist and Sedentary Communities

There exists an extensive body of research discussing the link between climate change, pastoralism, and conflict.

Climate change can exert pressure on existing resources, pushing pastoralists to migrate beyond their traditional routes and rendering traditional customary laws and conflict resolution mechanisms impotent (see Table 4 and Figure 1).²⁶ Climate-induced resource scarcity does not outright foster herder-farmer violence,²⁷ but given a sufficient degree of ethnic polarization,²⁸ political marginalization,²⁹ the (non)availability of dispute resolution mechanisms,³⁰ and dependence upon (rain-fed) agriculture,³¹ it can play a pivotal role in facilitating escalation. The literature on pastoralism, climate change, and conflict has a strong focus on Africa, in particular the Sahel,³² the Horn of Africa,³³ and Sub-Saharan Africa.³⁴ Herder-farmer tensions also exist within the Middle East³⁵ and Central Asia.³⁶ Within the literature, these regions remain largely undiscussed. There exists an extensive body of research discussing the link between climate change, pastoralism, and conflict. Most evidence describes how a change in environmental conditions can alter pastoralist migratory routes. Combined with several structural factors, this can contribute to the enflaming of inter-group violence.³⁷

26 See discussion by Sebastian van Baalen and Malin Mobjörk, 'A Coming Anarchy? Pathways from Climate Change to Violent Conflict in East Africa' (Stockholm, Sweden: Stockholm University, 2016), 26, https://www.statsvet.su.se/polopoly_fs/1.282383.14648527681/menu/standard/file/van%20Balen%20%26%20Mobj%C3%B6rk%20160511.pdf.

27 See for example: K. M. Witsenburg and A. W. Roba, 'Surviving Pastoral Decline: Pastoral Sedentarisation, Natural Resource Management and Livelihood Diversification in Marsabit District, Northern Kenya Deel: Vol. I' (2004), 767, <https://www.narcis.nl/publication/RecordID/oa:dare.uva.nl:publications%-2Fe244230a-9557-4d62-be72-fdf2400ede4f>.

28 Witsenburg and Roba, 767.

29 Eoin F. McGuirk and Nathan Nunn, 'Transhumant Pastoralism, Climate Change, and Conflict in Africa' (National Bureau of Economic Research, December 2020), 4, <https://www.nber.org/papers/w28243>.

30 For examples in Ethiopia, Kenya and Uganda, see: Patrick Meier, Doug Bond, and Joe Bond, 'Environmental Influences on Pastoral Conflict in the Horn of Africa', *Political Geography* 26, no. 6 (2007): 716–35, <https://doi.org/10.1016/j.polgeo.2007.06.001>; Andrew M. Linke et al., 'Rainfall Variability and Violence in Rural Kenya: Investigating the Effects of Drought and the Role of Local Institutions with Survey Data', *Global Environmental Change* 34 (1 September 2015): 35–47, <https://doi.org/10.1016/j.gloenvcha.2015.04.007>.

31 Hanne Fjelde and Nina von Uexkull, 'Climate Triggers: Rainfall Anomalies, Vulnerability and Communal Conflict in Sub-Saharan Africa', *Political Geography* 31, no. 7 (2012): 444–53, <https://doi.org/10.1016/j.polgeo.2012.08.004>.

32 E.g. Tor A. Benjaminsen and Boubacar Ba, 'Why Do Pastoralists in Mali Join Jihadist Groups? A Political Ecological Explanation', *The Journal of Peasant Studies* 46, no. 1 (2019): 1–20, <https://doi.org/10.1080/03066150.2018.1474457>.

33 E.g. Meier, Bond, and Bond, 'Environmental Influences on Pastoral Conflict in the Horn of Africa'.

34 E.g. Dylan Hendrickson, Robin Mearns, and Jeremy Armon, 'Livestock Raiding Among the Pastoral Turkana of Kenya: Redistribution, Predation and the Links to Famine', *IDS Bulletin (Brighton)* 27, no. 3 (1996): 17–30, <https://doi.org/10.1111/j.1759-5436.1996.mp27003003.x>; Charlene Cabot, *Climate Change, Security Risks, and Conflict Reduction in Africa: A Case Study of Farmer-Herder Conflicts over Natural Resources in Côte d'Ivoire, Ghana, and Burkina Faso 1960-2000*, Hexagon Series on Human and Environmental Security and Peace; Volume 12. (NL-LeOCL)326566635 (Berlin: Springer Verlag, 2017).

35 Roger Guiu, 'When Canals Run Dry, Displacement Triggered by Water Stress in the South of Iraq', No Matter of Choice: Displacement in a Changing Climate (Social Inquiry, February 2020), 16, <https://www.internal-displacement.org/sites/default/files/publications/documents/202002-iraq-slow-onset-report.pdf>.

36 E.g. Gulzana Kurmanalieva and Wibke Crewett, 'Institutional Design, Informal Practices and International Conflict: The Case of Community-Based Pasture Management in the Kyrgyz-Tajik Border Region', *Pastoralism* 9, no. 1 (11 October 2019): 15, <https://doi.org/10.1186/s13570-019-0145-9>.

37 Jonah Leff, 'Pastoralists at War: Violence and Security in the Kenya-Sudan-Uganda Border Region', *International Journal of Conflict and Violence (IJCV)* 3, no. 2 (20 December 2009): 192, <https://doi.org/10.4119/ijcv-2785>; Meier, Bond, and Bond, 'Environmental Influences on Pastoral Conflict in the Horn of Africa', 722.

Table 4. Climate Change-Related Resource Scarcity Leads to Conflict Between Pastoralist and Sedentary Communities

| Pathology | Climate Factors | Mediating Factors | Conflict | Regions prominently featured in literature |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|--------------------------------------------|
| Changes in temperature and precipitation cause forms of scarcity that force pastoralist groups to alter their transhumance routes. This precipitates resource competition between groups, infringes on traditional customary regulations, and increases conflict risk. | Temperature increase, erratic and/or decreased rainfall, droughts, heatwaves. | Resource scarcity, dependence upon agriculture, political and economic marginalization, customary laws and dispute resolution mechanisms, intergroup inequality, presence of water irrigation projects or other forms of human resource use. | Local and lower intensity inter-communal violence. | Africa, Middle East, Central Asia. |

There is no consensus on the level of precipitation needed to trigger conflict between pastoralists and farmers. Some argue that sustained droughts and desertification lead to altered migration and fuel conflict.³⁸ Others argue the contrary, positing that high rainfall increases pastoralist violence because abundant resources 'spur rent-seeking/wealth-seeking and recruitment of people to participate in violence.'³⁹ In Nigeria, observations lend credence to the notion that the desertification brought on by climate change can be catalyzed by human resource use.⁴⁰ In that country, the impact of climate change's effects – drought, changes in rainfall patterns, etc. – on vegetation cover were found to be exacerbated by population growth and by the side-effects of the expansion of urban areas.⁴¹

Pastoralist communities traditionally migrate between the wet and dry seasons to cope with long periods of droughts and to secure their pastures and livelihoods. This strategy has evolved over centuries, enabling a cooperative relationship between pastoralists and sedentary agriculturalists in which arable land is used for animal grazing in the dry season and for crop yields in the wet season. On traditional routes, pastoralists and farmers negotiate access to land and shared resources based on customary and informal laws.⁴² In the Lolita Forest in southern Kenya, for example, the neighboring Maasai communities traditionally share grazing lands peacefully, enabled by the clearly defined boundaries and customary laws that mediate the use of resources.⁴³

38 Eoin McGuirk and Nathan Nunn, 'Transhuman Pastoralism, Climate Change, and Conflict in Africa', NBER Working Paper Series, 2020, https://www.nber.org/system/files/working_papers/w28243/w28243.pdf.

39 Clionadh Raleigh and Dominic Kniveton, 'Come Rain or Shine: An Analysis of Conflict and Climate Variability in East Africa', *Journal of Peace Research* 49, no. 1 (1 January 2012): 51–64, <https://doi.org/10.1177/0022343311427754>.no. 1 (1 January 2012)

40 Marcus DuBois King, 'Water Stress, Instability, and Violent Extremism in Nigeria', in *Water, Security and US Foreign Policy* (Routledge, 2017), 128–48, <https://www.taylorfrancis.com/chapters/edit/10.4324/9781315168272-8/water-stress-instability-violent-extremism-nigeria-marcus-king>.

41 P. C. Nwilo et al., 'Impacts of Land Cover Changes on Desertification in Northern Nigeria and Implications on the Lake Chad Basin', *Journal of Arid Environments* 181 (1 October 2020): 104190, <https://doi.org/10.1016/j.jaridenv.2020.104190>.

42 van Baalen and Mobjörk, 'A Coming Anarchy? Pathways from Climate Change to Violent Conflict in East Africa', 26.

43 Adano, Wario R et al., 'Climate Change, Violent Conflict and Local Institutions in Kenya's Drylands', *Journal of Peace Research* 49, no. 1 (31 January 2012): 74, <https://doi.org/10.1177/0022343311427344>.

Climate-related loss of livestock may also increase friction between groups.

This symbiotic relation is put under pressure by temperature increase and erratic precipitation. When water irrigation mechanisms are absent,⁴⁴ it forces pastoralists to change their mobility patterns in search of areas that are richer in water and grazing land.⁴⁵ These lands often extend beyond traditional routes and agreed-upon corridors, leading them to encroach on farmers' lands during the wet season before the harvest. This results in damage to agriculture and creates competition over resources. Additionally, traditional conflict resolution mechanisms are not available along these new routes and these mechanisms become harder to access and sustain when access to small arms is plentiful.⁴⁶ This increases the risk that disputes over resource sharing escalate into violence.⁴⁷ To name a few examples, nomadic groups in Southern Kordofan in Sudan are forced to migrate further southwards due to droughts, thereby increasing competition with local farmers.⁴⁸ In Iraq's Missan province, farmers have complained of displaced people intruding on their farming ground, fueling preexisting prejudices towards livestock-reliant Marsh Arabs.⁴⁹ Climate-related loss of livestock may also increase friction between groups by increasing the frequency of cattle raiding. This practice, which in some regions is reported to be entrenched in local culture, may trigger retaliation and communal conflicts.⁵⁰

The risk that competition over resources following a change in migration routes triggers violent disputes is further contingent upon whether pastoralist groups are politically represented in their respective governments.⁵¹ In the absence of political representation, pastoralist groups have limited alternatives for securing their interests aside from resorting to violence. Within this context, government action can further strain relations between farmers and herders. Policies can facilitate and encourage violent communal conflicts by encouraging negative perceptions on behalf of pastoralists and prioritizing the expansion of agriculture – often at the detriment of the dry season pastures that are essential to their long-term survival.⁵²

The literature discusses and conceptualizes the conflicts between (and among) pastoralists and sedentary farmers as local and low-intensity conflicts without direct state involvement.⁵³ Within contexts where violence has recently occurred and where access to small arms and ammunition is abundant, large trade-flows of small-arms in the region,⁵⁴ the risk of these low-level conflicts escalating into larger-scale civil conflicts is increased – particularly in instances where government actors intervene.

44 McGuirk and Nunn, 'Transhumant Pastoralism, Climate Change, and Conflict in Africa', 4.

45 McGuirk and Nunn, 1.

46 Cirú Mwaúra and Susanne Schmeidl, *Early Warning and Conflict Management in the Horn of Africa* (The Red Sea Press, 2002), 40.

47 van Baalen and Mobjörk, 'A Coming Anarchy? Pathways from Climate Change to Violent Conflict in East Africa', 26; Alexander De Juan, 'Long-Term Environmental Change and Geographical Patterns of Violence in Darfur, 2003–2005', *Political Geography* 45 (1 March 2015): 24, <https://doi.org/10.1016/j.polgeo.2014.09.001>.

48 Charles Chavunduka and Daniel W. Bromley, 'Climate, Carbon, Civil War and Flexible Boundaries: Sudan's Contested Landscape', *Land Use Policy* 28, no. 4 (2011): 910. Chavunduka and Bromley, 910; van Baalen and Mobjörk, 'A Coming Anarchy? Pathways from Climate Change to Violent Conflict in East Africa', 26.

49 Guiu, 'When Canals Run Dry, Displacement Triggered by Water Stress in the South of Iraq'.

50 See NUPRI and SIPRI, 'Climate, Peace and Security Fact Sheet South Sudan', March 2021, 1, https://sipri.org/sites/default/files/Fact%20Sheet%20South%20Sudan_HR.pdf. See also Ivan Campbell, 'Climate Change and Conflict: Lessons from Community Conservancies in Northern Kenya', *Conservation Development Centre, International Institute for Sustainable Development and Saferworld*, November 2009, 11.

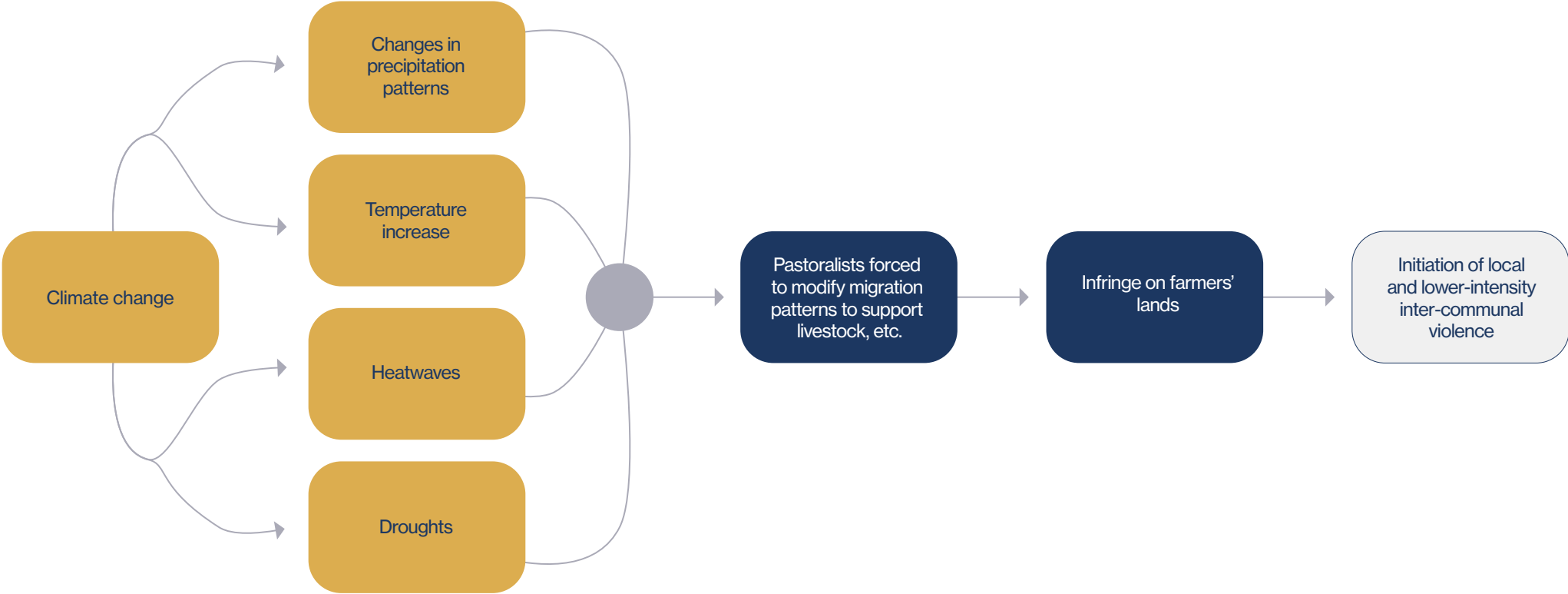
51 McGuirk and Nunn, 'Transhuman Pastoralism, Climate Change, and Conflict in Africa'.

52 Tor A. Benjaminsen et al., 'Does Climate Change Drive Land-Use Conflicts in the Sahel?', *Journal of Peace Research* 49, no. 1 (2012): 97–111.

53 McGuirk and Nunn, 'Transhumant Pastoralism, Climate Change, and Conflict in Africa'.

54 Leff, 'Pastoralists at War', 191.

Figure 1. Climate Change-Related Resource Scarcity Leads to Conflict Between Pastoralist and Sedentary Communities



Pathology 2:

Climate Change-Related Resource Scarcity Leads to Larger-Scale Inter-Communal Violence

Climate change can increase the scarcity of water, food, and land. This can nurture inter-communal violence (see Table 5 and Figure 2).⁵⁵ The risk is dependent upon demographic growth,⁵⁶ socio-economic development,⁵⁷ timing,⁵⁸ dependency upon (rain-fed) agriculture,⁵⁹ water and road infrastructures,⁶⁰ ethnic fragmentation,⁶¹ power-sharing arrangements,⁶² and economic and political marginalization.⁶³ The majority of existing research in this area focuses on Africa. Other regions experiencing communal violence over scarce resources are the Middle East⁶⁴ and parts of Asia.⁶⁵

The research on the climate-conflict nexus writ large is characterized by disagreement. The neo-Malthusian linkage between scarcity and conflict has been heavily challenged.⁶⁶ Disagreement on the scarcity-conflict link pertains due to different research designs, and operationalizations of the concepts 'resources' and 'conflict'. Different studies find contradicting evidence on the link between climate-induced water scarcity and various forms of large-scale political violence including civil war.⁶⁷ Land degradation has been identified as a factor that significantly increases the risk of civil conflict, though this finding should be

The research on the climate-conflict nexus writ large is characterized by disagreement.

55 See Fjelde and von Uexkull, 'Climate Triggers'. See also Scheffran et al., 'Climate Change and Violent Conflict'.

56 Thomas F. Homer-Dixon, *Environment, Scarcity, and Violence*.

57 Nina von Uexkull et al., 'Civil Conflict Sensitivity to Growing-Season Drought', *Proceedings of the National Academy of Sciences* 113, no. 44 (1 November 2016): 12391–96, <https://doi.org/10.1073/pnas.1607542113>.

58 In this case, timing refers to whether climate change-related events manifest during key periods in the crop cultivation cycle. The risk of farming communities entering into disputes over water management is higher if, for example, the effects of unequitable water management coincide with climate change-related pressures during a period which is crucial to Uexkull et al.

59 Uexkull et al.

60 Adrien Detges, 'Local Conditions of Drought-Related Violence in Sub-Saharan Africa: The Role of Road and Water Infrastructures', *Journal of Peace Research* 53, no. 5 (2016): 696–710.

61 Uexkull et al., 'Civil Conflict Sensitivity to Growing-Season Drought', 1 November 2016. And see for the discussion between ethnic groups and conflict among others: Lars-Erik Cederman, Andreas Wimmer, and Brian Min, 'Why Do Ethnic Groups Rebel? New Data and Analysis', *World Politics* 62, no. 1 (January 2010): 87–119, <https://doi.org/10.1017/S0043887109990219>.

62 Jonas B Bunte and Laura Thaut Vinson, 'Local Power-Sharing Institutions and Interreligious Violence in Nigeria', *Journal of Peace Research* 53, no. 1 (1 January 2016): 49–65, <https://doi.org/10.1177/0022343315614999>.

63 Fjelde and von Uexkull, 'Climate Triggers'; Uexkull et al., 'Civil Conflict Sensitivity to Growing-Season Drought', 1 November 2016.

64 Dylan O'Driscoll, 'Emerging Trends of Conflict and Instability in Iraq' (K4D Helpdesk Report UK Department for International Development, November 2018), https://assets.publishing.service.gov.uk/media/5c18d35ee5274a468ba7fab3/433_Emerging_Trends_of_Conflict_and_Instability_in_Iraq.pdf.

65 See for example the case of India: Henrik Urdal, 'Population, Resources, and Political Violence: A Subnational Study of India, 1956–2002', *The Journal of Conflict Resolution* 52, no. 4 (2008): 590–617, <https://doi.org/10.1177/0022002708316741>.

66 See Koubi, 'Climate Change and Conflict', 346. See also Raleigh, Choi, and Kniveton, 'The Devil Is in the Details', 1 May 2015.

67 For opposite positions, see Ole Magnus Theisen, Helge Holtermann, and Halvard Buhaug, 'Climate Wars? Assessing the Claim That Drought Breeds Conflict', *International Security* 36, no. 3 (2011): 79–106. on one side, and Solomon M. Hsiang, Marshall Burke, and Edward Miguel, 'Quantifying the Influence of Climate on Human Conflict', *Science* 341, no. 6151 (2013). on the other.

Table 5. Climate Change-Related Resource Scarcity Leads to Larger-Scale Inter-Communal Violence

| Pathology | Climate Factors | Mediating Factors | Conflict | Regions prominently featured in literature |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|-----------------------------------------------------------------------------|
| Climate change-induced scarcity of water, food, and land resources, in combination with social, political, geographic, and economic variables, can trigger inter-communal tensions. | Temperature increase, decreased or erratic precipitation, droughts, heatwaves, and other extreme weather events. | Level of socio-economic development, dependence upon (rain-fed) agriculture, timing (growing-season or not), political instability, demographic pressure, water and road infrastructure, power-sharing arrangements, ethnic fragmentation, political and economic marginalization. | Local, inter-communal, inter-ethnic violence; civil unrest. | Middle East, Sahel and Sub-Saharan Africa, Central and Latin America, Asia. |

treated with caution because land degradation is operationalized differently across studies.⁶⁸ Evidence focused on the effect of water and land scarcity and *local inter-communal conflict*, especially in the context of low levels of development and high degrees of political and economic marginalization, is more robust.⁶⁹

Deviations in rainfall, temperature rise, and prolonged and more intense droughts can aggravate water and land scarcity, particularly when they affect vulnerable groups.⁷⁰ When droughts occur during crop cultivation in agriculturally dependent countries – and in areas with low levels of economic development – they can increase the risk of violence.⁷¹ Demographic growth further exacerbates land, water, and resource scarcity and intensifies competition.⁷² Against the background of unequal power and resource sharing arrangements, minorities' access to water and land can be obstructed. The risk of conflict erupting further increases in localities where water and road infrastructures are absent.⁷³

Groups struggling to sustain their livelihood can turn to violence as a means of securing resources, especially when there are no alternate coping mechanisms (such as market transfers or state accommodation) available to them.⁷⁴ In this sense, conflicts over natural resources are distributional in nature. Climatic change's adverse effects have a disproportionately high negative impact on indigenous⁷⁵ or ethnic groups,⁷⁶ meaning that these groups are also the most likely to experience localized forms of violence. As an example, in Iraq,

68 Ole Magnus Theisen, 'Blood and Soil? Resource Scarcity and Internal Armed Conflict Revisited', *Journal of Peace Research* 45, no. 6 (1 November 2008): 801–18, <https://doi.org/10.1177/0022343308096157>.no. 6 (1 November 2008)

69 See for example: Clionadh Raleigh, 'Political Marginalization, Climate Change, and Conflict in African Sahel States', *International Studies Review* 12, no. 1 (2010): 69–86; Detges, 'Local Conditions of Drought-Related Violence in Sub-Saharan Africa'; Theisen, 'Blood and Soil?' For the link between land scarcity and conflict see: Paola Vesco et al., 'Natural Resources and Conflict: A Meta-Analysis of the Empirical Literature', *Ecological Economics* 172 (2020): 106633–, <https://doi.org/10.1016/j.ecolecon.2020.106633>.

70 Scheffran and Battaglini, 'Climate and Conflicts'; Scheffran et al., 'Climate Change and Violent Conflict'.

71 See Uexkull et al., 'Civil Conflict Sensitivity to Growing-Season Drought', 1 November 2016. See also Nina von Uexkull et al., 'Civil Conflict Sensitivity to Growing-Season Drought', *Proceedings of the National Academy of Sciences* 113, no. 44 (1 November 2016): 12391–96, <https://doi.org/10.1073/pnas.1607542113>.

72 Thomas F. Homer-Dixon, *Environment, Scarcity, and Violence*, 55.

73 Detges, 'Local Conditions of Drought-Related Violence in Sub-Saharan Africa'.

74 Raleigh, 'Political Marginalization, Climate Change, and Conflict in African Sahel States'.

75 Ramachandra Guha and Joan Martínez Alier, *Varieties of Environmentalism: Essays North and South* (London: Routledge, 2013), <https://doi.org/10.4324/9781315070766>.

76 Robert D. Bullard, *Confronting Environmental Racism: Voices from the Grassroots* (South End Press, 1993).

Groups struggling to sustain their livelihood can turn to violence as a means of securing resources.

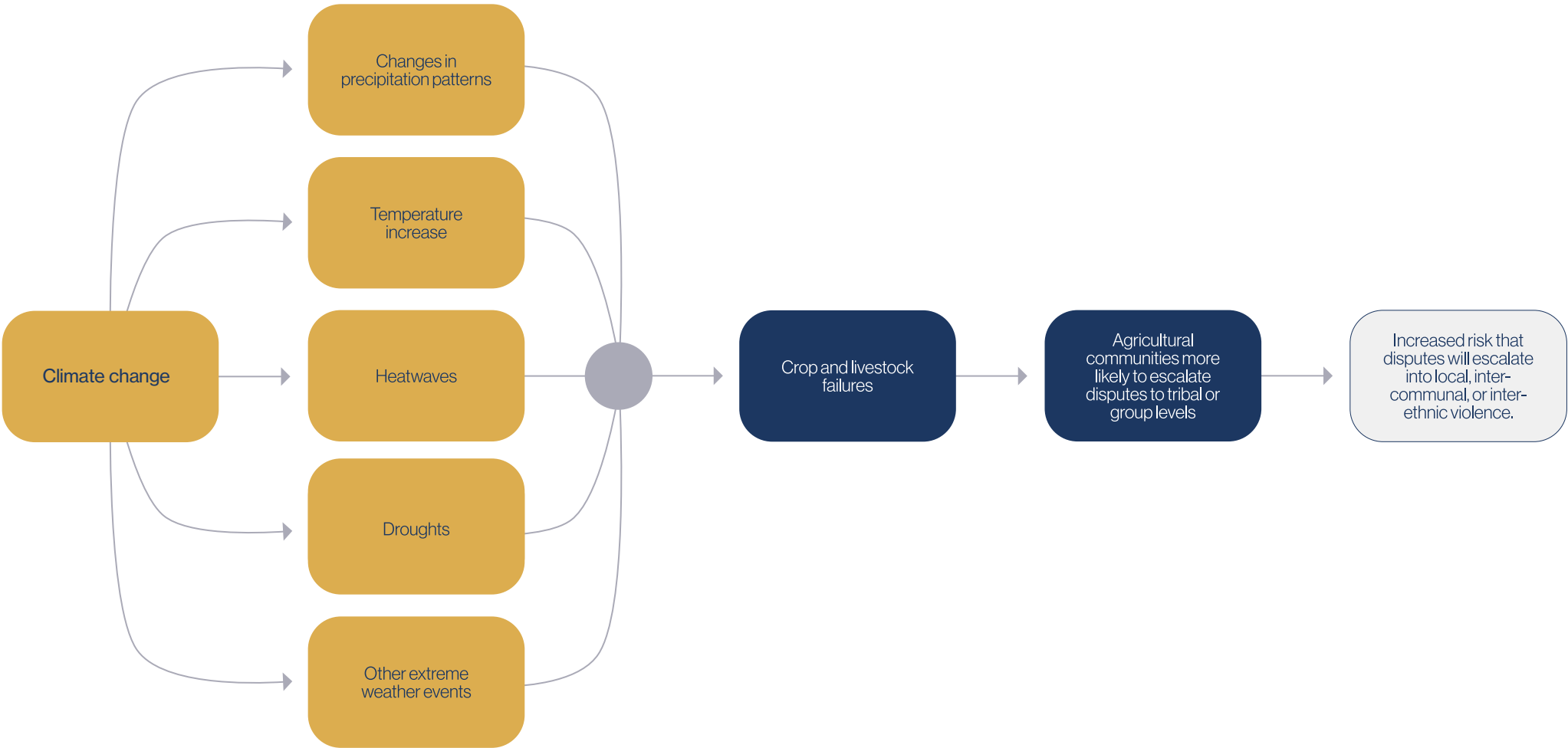
increasingly erratic rainfall has combined with variables such as the construction of upstream dams and shortcomings in the country's water management system to reduce river flow volumes by up to 40%.⁷⁷ In the country's Missan province, this water scarcity, particularly when combined with preexisting tribal disagreements, has led local sheiks to intervene in water allocation processes, with some taking action to prevent water from reaching farms operated by rival clans.⁷⁸ The situation has created a risk of a conflict escalation, not least because members of affected tribes are engaged in (competing) criminal activities.

Conflict associated with this pathology can range from low to medium-high levels. On the low end of the spectrum, it can sometimes be conflated with gang violence or revenge killings. At the higher end, it takes the form of (ongoing) violent clashes between clearly defined communities. The likelihood of this pathology escalating to larger-scale forms of conflict is context-dependent, with factors ranging from the identity of victims, victims' standing with tribal structures, the state of inter-tribe or inter-group relations, and the legitimacy of local authorities being potentially relevant depending on context.

⁷⁷ Laurie Goering, 'As Climate Threats Grow, Iraq Battles a New Enemy: Water Shortages', *Reuters*, 12 December 2017, sec. Big Story 10, <https://www.reuters.com/article/us-iraq-water-security-idUSKBN1E627O>.

⁷⁸ Mustafa Saadoun, 'Tribal Disputes Flare in Southern Iraq over Water Scarcity', *Al-Monitor*, 14 February 2018, <https://www.al-monitor.com/originals/2018/02/water-security-iraq-tribal-conflicts.html>.

Figure 2. Climate Change-Related Resource Scarcity Leads to Larger-Scale Inter-Communal Violence



Pathology 3:

Climate Change Precipitates Internal Migration, Leading to Social Unrest

Both slow-onset climatic changes (precipitation decrease, temperature increase, drought, etc.) and rapid-onset climate hazards (floods, storms, forest fires, etc.) can cause internal migration (see Table 6 and Figure 3).⁷⁹ Under some circumstances, migration can contribute to an increase in the risk that conflict will initiate. Factors that influence whether climate-induced rural-urban migration will contribute to sparking conflict include institutional capacity, resource scarcity, socio-economic development, ethnic fragmentation, and demographic growth.⁸⁰

Within Africa, the Middle East and North Africa, Latin America, and Southeast Asia, areas characterized by a high degree of urbanization and low socio-economic development are at greatest risk of experiencing conflict as a (partial) result of climate change-related migration. The environmental security literature finds no direct link between climate stressors and inevitable migration, though indirect links have been well catalogued.⁸¹ Scholars agree on the tremendous importance of context-dependent structural factors as predictors of individuals' decision to migrate as a result of climate stressors, as well as of whether said migration risks precipitating social unrest.⁸² At the same time, there is no consensus on exactly *how* this plethora of variables interact.⁸³ Research has found that climate stressors incentivize migration – both between rural areas and from rural to urban areas – and that migration may contribute to conflict.⁸⁴ Other studies argue it is not migration that leads to conflict, but the disorder that manifests as a consequence of economic shocks, ongoing civil conflicts, or a lack of institutional capacity.⁸⁵

Under some circumstances, migration can contribute to an increase in the risk that conflict will initiate.

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- 79 See Walter Kaelin, 'Conceptualising Climate-Induced Displacement', in *Climate Change and Displacement: Multidisciplinary Perspectives* (Oxford: Hart Publishing, 2010), https://www.researchgate.net/publication/292357065_Conceptualising_climate-induced_displacement. For a meta-analysis, see also Roman Hoffmann et al., 'A Meta-Analysis of Country-Level Studies on Environmental Change and Migration', *Nature Climate Change* 10, no. 10 (October 2020): 904–12, <https://doi.org/10.1038/s41558-020-0898-6>; Tobias Ide et al., 'Multi-Method Evidence for When and How Climate-Related Disasters Contribute to Armed Conflict Risk', *Global Environmental Change* 62 (1 May 2020): 102063, <https://doi.org/10.1016/j.gloenvcha.2020.102063>; Scheffran and Battaglini, 'Climate and Conflicts'; Scheffran et al., 'Climate Change and Violent Conflict'.
- 80 Ide et al., 'Multi-Method Evidence for When and How Climate-Related Disasters Contribute to Armed Conflict Risk'.
- 81 Marc Kodack, 'The Complexity of the Climate Change, Migration and Conflict Nexus', The Center for Climate & Security, 2020, <https://climateandsecurity.org/2020/12/the-complexity-of-the-climate-change-migration-and-conflict-nexus/>; Hoffmann et al., 'A Meta-Analysis of Country-Level Studies on Environmental Change and Migration'.
- 82 Richard Black et al., 'The Effect of Environmental Change on Human Migration', *Global Environmental Change, Migration and Global Environmental Change – Review of Drivers of Migration*, 21 (1 December 2011): S3–11, <https://doi.org/10.1016/j.gloenvcha.2011.10.001>.
- 83 See Black et al. See also Silja Klepp and Christiane Fröhlich, eds., *Migration and Conflict in a Global Warming Era*, 2020, <https://www.mdpi.com/books/pdfview/book/3082>.
- 84 See Rafael Reuveny, 'Climate Change-Induced Migration and Violent Conflict', *Political Geography*, Climate Change and Conflict, 26, no. 6 (1 August 2007): 656–73. It is important to note that research has also found that migration can act as a positive adaptation which, by reducing resource competition within a geographic area, reduces the risk of conflict breaking out. See for example Jan Selby et al., 'Climate Change and the Syrian Civil War Revisited', *Political Geography* 60 (1 September 2017): 232–44, <https://doi.org/10.1016/j.polgeo.2017.05.007>. The authors do not consider these arguments as being contradictory of one-another. Localized reductions in conflict risk are context specific, and do not apply to all localities. Moreover, migration leading to a reduction in conflict risk at the local level does not preclude the validity of the mechanism described in this pathology (namely: its contribution to an increased risk in a different part of the country).
- 85 See Halvard Buhaug and Henrik Urdal, 'An Urbanization Bomb? Population Growth and Social Disorder in Cities', *Global Environmental Change* 23, no. 1 (2013): 1–10, <https://doi.org/10.1016/j.gloenvcha.2012.10.016>. See also Gudrun Ostby, 'Rural–Urban Migration, Inequality and Urban Social Disorder: Evidence from African and Asian Cities', *Conflict Management and Peace Science* 33, no. 5 (2016): 491–515, <https://doi.org/10.1177/0738894215581315>. See also Homer-Dixon, *Environment, Scarcity, and Violence*, 140–42.

Table 6. Climate Change Precipitates Internal Migration, Leading to Social Unrest

| Pathology | Climate Factors | Mediating Factors | Conflict | Regions prominently featured in literature |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|
| Climate change can lead to migration, whether from rural to urban areas or between rural areas. This can spark social unrest by increasing resource competition and exacerbating feelings of relative deprivation, as well as the severity of inter-cultural clashes. | Rapid onset hazards such as floods, storms, and forest fires. Slow onset hazards such as temperature change, precipitation decrease, and drought. | Institutional capacity, resource scarcity, level of socio-economic development, ethnic fragmentation, demographic growth. | Local and low-intensity conflict, such as social unrest, riots, protesting, and inter-ethnic violence. | Africa, Middle East and North Africa, South Asia, Latin America. |

A key mechanism linking climate change to migration has to do with the viability of making a living through agriculture. Climate variability can contribute to the deterioration of agricultural conditions, decreases the availability of resources.⁸⁶ Crop failures – particularly in rural areas – render agricultural enterprises nonviable, prompting farmers to migrate to greener pastures or to urban centers in search of new livelihoods.⁸⁷ The influx of these ‘Malthusian refugees’ disrupts the status quo in the areas they migrate to and, depending on the scale of the migration and on government capacity, can overwhelm public services. This may contribute to the onset of conflict.⁸⁸ In ethnically fractured contexts,⁸⁹ migration may cause increased tensions between ethnic groups which have traditionally had limited interactions with one another due to geography, increasing the risk of inter-communal violence.⁹⁰ In weak and non-democracies, a failure to deliver public services may contribute to the escalation of social unrest.⁹¹ Climate-induced migration commonly occurs in areas dependent upon rain-fed agriculture, but has also been observed in other contexts. A clear example can be observed in extreme weather events such as hurricanes, coastal flooding, or wildfires. These have all been shown to be exacerbated by climate change,⁹² and can prompt migration by destroying domiciles, knocking out public services, or wrecking businesses. Environmental effects impact migration differently in different world regions. In Asia, higher than average rainfall induces rural-urban migration. In Sub-Saharan Africa, lower precipitation is linked to faster-growing cities.⁹³ Influxes of climate migrants can also put pressure on the economy in the host area, increasing resource

86 Vally Koubi et al., ‘The Determinants of Environmental Migrants’ Conflict Perception’, *International Organization* 72, no. 4 (ed 2018): 905–36, <https://doi.org/10.1017/S0020818318000231>.

87 Black et al., ‘The Effect of Environmental Change on Human Migration’.

88 See S. Hazarika, ‘Bangladesh and Assam: Land Pressures, Migration and Ethnic Conflict’, 1993, <https://idl-bnc-idrc.dspacedirect.org/handle/10625/20302>; Black et al., ‘The Effect of Environmental Change on Human Migration’. See also Vally Koubi et al., ‘Environmental Migrants and Social-Movement Participation’, *Journal of Peace Research* 58, no. 1 (2021): 18–32. and Gabriele Spilker et al., ‘Attitudes of Urban Residents towards Environmental Migration in Kenya and Vietnam’, *Nature Climate Change* 10, no. 7 (July 2020): 622–27, <https://doi.org/10.1038/s41558-020-0805-1>.

89 See Carl-Friedrich Schleussner et al., ‘Armed-Conflict Risks Enhanced by Climate-Related Disasters in Ethnically Fractionalized Countries’, *Proceedings of the National Academy of Sciences* 113, no. 33 (16 August 2016): 9216–21, <https://doi.org/10.1073/pnas.1601611113>. See also Ide et al., ‘Multi-Method Evidence for When and How Climate-Related Disasters Contribute to Armed Conflict Risk’.

90 Nikhar Gaikwad and Gareth Nellis, ‘The Majority-Minority Divide in Attitudes toward Internal Migration: Evidence from Mumbai’, *American Journal of Political Science* 61, no. 2 (2017): 456–72, <https://doi.org/10.1111/ajps.12276>.

91 Homer-Dixon, ‘Urban Growth and Violence: Will the Future Resemble the Past?’ • Thomas Homer-Dixon, *Thomas Homer-Dixon* (blog), 1 June 1995, <https://homerdixon.com/urban-growth-and-violence-will-the-future-resemble-the-past/>.

92 Peter Stott, ‘How Climate Change Affects Extreme Weather Events’, *Science* 352, no. 6293 (2016): 1517–18.

93 David Castells-Quintana and Thomas K.J. McDermott†, ‘Climate, Urbanisation and Conflict: The Effects of Weather Shocks and Floods on Urban Social Disorder’, 2019, 1, <https://lagv2019.sciencesconf.org/249795/document>.

Climate-related migration has the potential of contributing to the onset of conflict by playing a role in deepening deprivation, group-identity, resource competition, and discontent towards central authorities.

competition, food prices, and unemployment.⁹⁴ In the context of already scarce food, water, and land resources, this can result in uprisings and protests.⁹⁵

It can therefore be surmised that climate-related migration has the potential of contributing to the onset and escalation of conflict by playing a role in deepening deprivation, exacerbating group-identity cleavages, intensifying resource competition, and fostering discontent towards central authorities.⁹⁶ In most cases, the type of conflict associated with climate-induced rural-urban migration is low-intensity violence. This includes food riots, protests, social unrest, and inter-ethnic clashes.⁹⁷ For instance, in India, poor integration of new migrants has fueled anti-migrant movements, with the so-called “sons of the soil feeling their status is challenged by the newcomers.”⁹⁸ In extreme cases, rural-urban migration has the potential to proliferate into larger-scale civil armed conflict or full-blown civil war. Political elites may capitalize on existing frustrations and social grievances, shaping politics along ethnic lines to fuel support. This aggravates political and economic marginalization and incites larger-scale insurgencies against the state.⁹⁹ Illustrative is the case of Syria. Before the Syrian civil war started, the Fertile Crescent region, spanning parts of Iraq, Syria, Lebanon, Palestine, Israel, Jordan, and Egypt, experienced the most severe drought on record.¹⁰⁰ In Syria, this drought combined with poor agricultural management resulted in massive agricultural losses. Approximately 1.5 million people migrated from rural to urban areas, placing significant pressure on existing economic, social, and political structures.¹⁰¹ Urban areas quickly emerged as cradles of social unrest, ultimately leading to a cascade into civil war.¹⁰² While the pathways between climate, migration, and conflict are contested and remain inconclusive, these cases warrant the pathology’s inclusion.¹⁰³

94 Paul Collier, Gordon Conway, and Tony Venables, ‘Climate Change and Africa’, *Oxford Review of Economic Policy* 24, no. 2 (2008): 337–53, <https://doi.org/10.1093/oxrep/grn019>.

95 See for the link between food insecurity and social unrest for example: Halvard Buhaug et al., ‘Climate Variability, Food Production Shocks, and Violent Conflict in Sub-Saharan Africa’, *Environmental Research Letters* 10, no. 12 (2015): 125015; Clionadh Raleigh, Hyun Jin Choi, and Dominic Kniveton, ‘The Devil Is in the Details: An Investigation of the Relationships between Conflict, Food Price and Climate across Africa’, *Global Environmental Change* 32 (2015): 187–99; Marc F. Bellemare, ‘Rising Food Prices, Food Price Volatility, and Social Unrest’, *American Journal of Agricultural Economics* 97, no. 1 (2015): 1–21, <https://doi.org/10.1093/ajae/aa038>; Cullen Hendrix and Henk-Jan Brinkman, ‘Food Insecurity and Conflict Dynamics: Causal Linkages and Complex Feedbacks’, *Stability: International Journal of Security and Development* 2, no. 2 (17 June 2013): Art. 26, <https://doi.org/10.5334/sta.bm>; Todd Graham Smith, ‘Feeding Unrest: Disentangling the Causal Relationship between Food Price Shocks and Sociopolitical Conflict in Urban Africa’, *Journal of Peace Research* 51, no. 6 (1 November 2014): 679–95, <https://doi.org/10.1177/0022343314543722>; Ida Rudolfsen, ‘Food Price Increase and Urban Unrest: The Role of Societal Organizations’, *Journal of Peace Research* 58, no. 2 (13 July 2020): 215–30, <https://doi.org/10.1177/0022343319899705>.

96 This relationship is extremely case-specific, and does not apply universally. See for example Selby et al., ‘Climate Change and the Syrian Civil War Revisited’, 1 September 2017, which posits that – contrary to popular belief – climate-related migration played almost no role in precipitating the events of the Syrian civil war.

97 See for example: Theodora-Ismene Gizelis, Steve Pickering, and Henrik Urdal, ‘Conflict on the Urban Fringe: Urbanization, Environmental Stress, and Urban Unrest in Africa’, *Political Geography* 86 (1 April 2021): 102357, <https://doi.org/10.1016/j.polgeo.2021.102357>.

98 Grace Huang and Kevin H. Kopper, ‘Rural-Urban Migration Experiments in China and India’, SSRN Scholarly Paper (Rochester, NY: Social Science Research Network, 2009), 15, <https://papers.ssrn.com/abstract=1450120>.

99 van Baalen, Sebastian and Mobjörk, Malin, ‘A Coming Anarchy? Pathways from Climate Change to Violent Conflict in East Africa’ (Stockholm University, 2016), 30, https://www.statsvet.su.se/polopoly_fs/1.282383.1464852768!/menu/standard/file/van%20Balen%20%26%20Mobj%C3%B6rk%20160511.pdf.

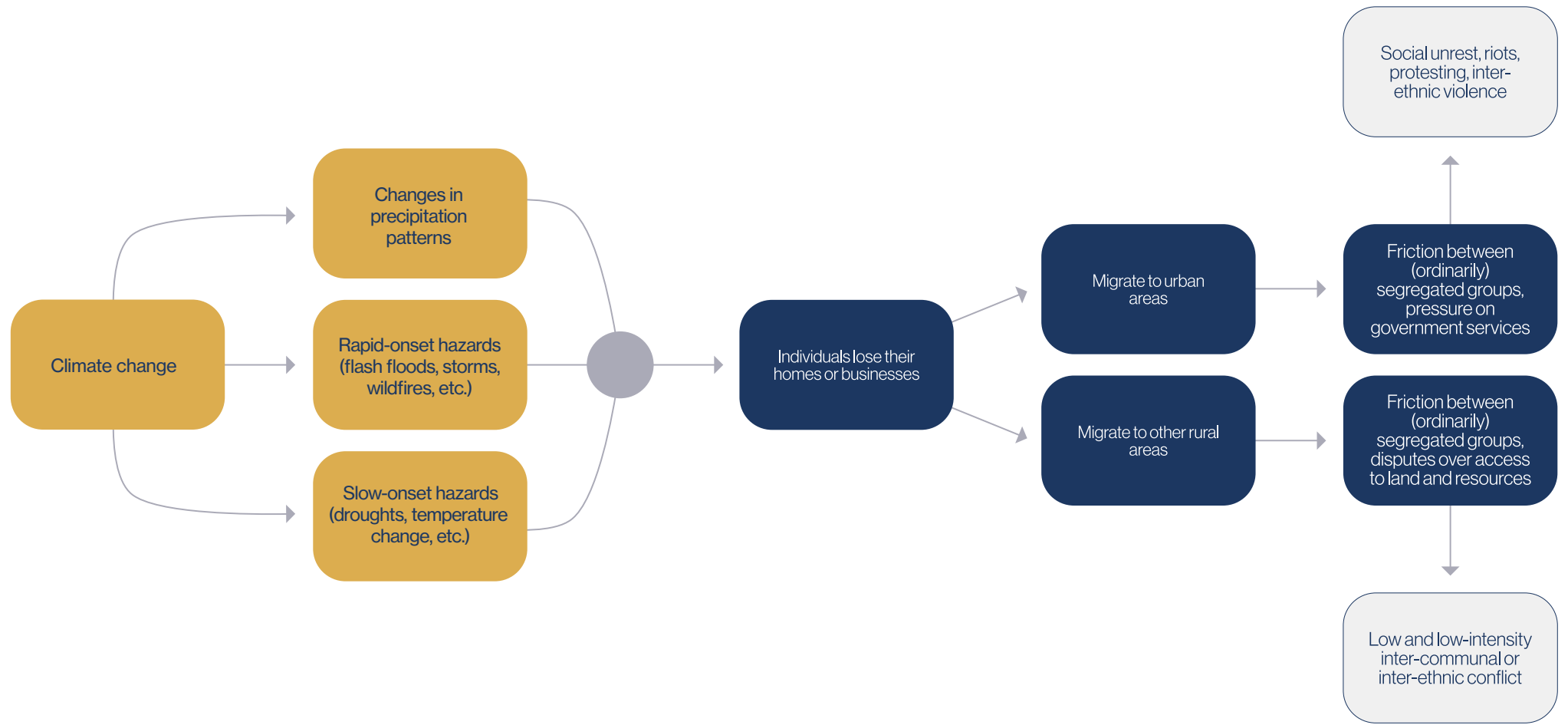
100 Colin P. Kelley et al., ‘Climate Change in the Fertile Crescent and Implications of the Recent Syrian Drought’, *Proceedings of the National Academy of Sciences* 112, no. 11 (17 March 2015): 3241–46.

101 Kelley et al., 3241.

102 Academic consensus surrounding the Syrian civil war’s link to climate change remains fractured, with many arguing (among others) that the war is largely a result of the Assad regime’s overreaction to social unrest. See Francesca De Châtel, ‘The Role of Drought and Climate Change in the Syrian Uprising: Untangling the Triggers of the Revolution’, *Middle Eastern Studies* 50, no. 4 (4 July 2014): 521–35, <https://doi.org/10.1080/00263206.2013.850076>. See also Christiane J. Fröhlich, ‘Climate Migrants as Protestors? Dispelling Misconceptions about Global Environmental Change in Pre-Revolutionary Syria’, *Contemporary Levant* 1, no. 1 (2 January 2016): 38–50, <https://doi.org/10.1080/20581831.2016.1149355>; Jan Selby et al., ‘Climate Change and the Syrian Civil War Revisited’, *Political Geography* 60 (1 September 2017): 232–44, <https://doi.org/10.1016/j.polgeo.2017.05.007>.

103 Michael Brzoska and Christiane Fröhlich, ‘Climate Change, Migration and Violent Conflict: Vulnerabilities, Pathways and Adaptation Strategies’, *Migration and Development* 5, no. 2 (3 May 2016): 190–210.

Figure 3. Climate Change Precipitates Internal Migration, Leading to Social Unrest



Pathology 4:

Climate Change-Related Social Unrest Empowers Nonstate Armed Groups

Changes in temperature, precipitation levels, and extreme weather events can contribute to the emergence and expansion of non-state armed groups (NSAGs – see Table 7 and Figure 4).¹⁰⁴ NSAGs include a variety of violent actors, ranging from youth and street gangs to (organized) criminal groups and terrorist organizations such as the Islamic State (ISIS) in Iraq and Syria or Al-Qaeda. Poverty, social tensions, and weak political institutions are the primary factors linking climate change to NSAG-related forms of conflict.¹⁰⁵ Regions identified as being at risk of experiencing this type of conflict are the Sahel, Sub-Saharan Africa, the Middle East, and North Africa as well as parts of Asia and Latin America.¹⁰⁶

The literature linking climate change to NSAGs stresses the importance of context. The evidence surrounding *how* and which types of NSAGs thrive as an indirect result of climate change stresses the relevance of context-specific variables. The literature can be divided into camps. The first identifies a simple one-way indirect relationship in which climate change aggravates existing social vulnerabilities and empowers NSAGs. The second discusses a more complex feedback loop in which practices of armed groups and climate change reinforce one-another.¹⁰⁷ Overall, it can be surmised that climate change facilitates power consolidation on the part of NSAGs by exacerbating preexisting state fragility, a causal pathway of which one possible incarnation is described in the previous section. An example of this pathology manifesting can be observed in Pakistan. In July 2010, heavy monsoon rains flooded one-fifth of the country, killing approximately 2,000 people and affecting 20 million others by ravaging villages and arable land. Islamist militant groups, the Taliban included, stepped in to provide services and relief aid to victims.¹⁰⁸

The first way in which the exacerbation of state fragility facilitates NSAGs is by bolstering their recruitment opportunities. Climate change or climate hazards can make traditional livelihoods increasingly untenable to sustain, forces individuals to look for alternative – whether formal, informal, or illegal – sources of income. The opportunity costs associated with turning to crime decrease, making it more attractive to join an armed group, especially in instances where socio-economic development is low and alternative options are limited.¹⁰⁹ Pakistan is, once again, illustrative of this dynamic.¹¹⁰ Because these scenarios are oftentimes coupled with

104 Jeremiah O. Asaka, 'Climate Change - Terrorism Nexus? A Preliminary Review/Analysis of the Literature', *Perspectives on Terrorism* 15, no. 1 (2021): 81–92.

105 Asaka, '2014 Quadrennial Defense Review: Department of Defense Budget Priorities Under Sequestration Cuts, Defense Strategy, Rebalancing the Joint Force', accessed 4 October 2021, <https://books.apple.com/us/book/2014-quadrennial-defense-review-department-of/id842926774>.

106 Lukas Rüttinger, 'Insurgency, Terrorism and Organised Crime in a Warming Climate', *Climate Diplomacy*, 26 April 2017, <https://climate-diplomacy.org/magazine/conflict/insurgency-terrorism-and-organised-crime-warming-climate>.

107 Asaka, 'Climate Change - Terrorism Nexus?'

108 Joshua Eastin, 'Fuel to the Fire: Natural Disasters and the Duration of Civil Conflict', *International Interactions* 42, no. 2 (14 March 2016): 322–23, <https://doi.org/10.1080/03050629.2016.1115402>.

109 Kawa Hassan, Camilla Born, and Pernilla Nordqvist, 'Iraq: Climate-Related Security Risk Assessment', *Prevention Web*, 2018, <https://www.preventionweb.net/publication/iraq-climate-related-security-risk-assessment>. This article demonstrates how diminished agricultural livelihoods increase local support for terrorist groups.

110 As described in: Eastin, 'Fuel to the Fire', 322; Neha Nautiyal, 'बाढ़ग्रस्त पाक में मदद के बदले तालिबान खड़े कर रहा नए लड़ाके', <https://hindi.oneindia.com>, 31 August 2010, <https://hindi.oneindia.com/news/2010/08/31/taliban-ask-pakistan-flood-relief-give-terrorist.html>.

Climate change facilitates power consolidation on the part of NSAGs by exacerbating preexisting state fragility.

Table 7. Climate Change-Related Social Unrest Empowers Nonstate Armed Groups

| Pathology | Climate Factors | Mediating Factors | Conflict | Regions prominently featured in literature |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|
| Climate change interacts with state fragility and contributes to livelihood deterioration, creating fertile ground for the emergence and expansion of non-state armed groups (NSAGs). | Temperature increase, erratic and/or decreased rainfall. Extreme weather events such as heatwaves, floods, or storms. | State fragility, dependence upon (rain-fed) agriculture, resource scarcity, level of economic development, quality of infrastructure and public services, unemployment, presence of non-state armed groups, degree of ethnic fragmentation, economic and political marginalization. | Civil armed conflict, including terrorism, guerrilla warfare and insurgencies against the state. Many of these forms of conflict can become internationalized given the correct circumstances. | Africa (Sahel, Sub-Saharan), Middle East, Asia, Latin America. |

authorities' inability to provide public services or to alleviate the situation, NSAGs recruitment process is also helped by an increase in individual-level receptiveness to their messaging and ideologies.¹¹¹ These situations also provide NSAGs' with an opportunity to increase their legitimacy through the provision of public services ordinarily administered by the state,¹¹² another boon for recruitment.

Climate change-related exacerbation of state fragility also empowers NSAGs' to engage in the strategic weaponization of resources.¹¹³ An erosion or collapse of authorities' ability to administer geographic regions has, in some cases, resulted in NSAGs gaining control over scarce (natural) resources. A case in point is Somalia. When a drought occurred in the early 2000s, the terrorist group al-Shabab quickly gained control of the country's green lands. The group exploited the land and the farmers which depended on it to generate income and to secure a stranglehold over the region.¹¹⁴ Numerous other examples of armed and insurgent groups deploying water as a weapon to expand their control and reach overpopulations and geographical areas also exist.¹¹⁵ As an example, the Islamic State in Iraq and Syria (ISIS) – which also benefitted from revenues generated by Iraq's oil fields – employed its control over water-based resources to deny several villages' and towns' access to drinking water by cutting flows through the Khalis tributary off for ten days.¹¹⁶ The civil war unfolding in Yemen

111 Asaka, 'Climate Change - Terrorism Nexus?', 87.

112 Louis-Philippe Caron, 'The Threat Multiplier: Analyzing the Relationship between Climate Change and the Emergence of Violent Non-State Actors in Western Africa' (A.L.M., United States -- Massachusetts, Harvard University, 2020), 7, <https://www.proquest.com/docview/2532072824/abstract/889C1264391647CCPQ/1>. Harvard University, 2020

113 Rüttinger, 'Insurgency, Terrorism and Organised Crime in a Warming Climate'; SIPRI, 'Pathways of Climate Insecurity: Guidance for Policymakers', November 2020.

114 SIPRI et al., 'Pathways of Climate Insecurity: Guidance for Policymakers' (SPIRI, November 2020), 6, <https://www.sipri.org/publications/2020/sipri-policy-briefs/pathways-climate-insecurity-guidance-policymakers>; Karolina Eklow and Florian Krampe, 'Climate-Related Security Risks and Peacebuilding in Somalia' (SIPRI, October 2019), 23, https://www.sipri.org/sites/default/files/2019-10/sipripp53_2.pdf.

115 Paola Andrea Spadaro, 'Climate Change, Environmental Terrorism, Eco-Terrorism and Emerging Threats', *Journal of Strategic Security* 13, no. 4 (December 2020): 69, <https://doi.org/10.5038/1944-0472.13.4.1863>.

116 Mansouriya, Salam, and Saraiq specifically. See Al-Aan TV, 'أخبار الآن - العراق شرق شمال شرق العراق - 5 أيار الآن', 5 October 2014, <https://www.youtube.com/watch?v=6pGBtNbCkik>; Marcus DuBois King, 'The Weaponization of Water in Syria and Iraq', *The Washington Quarterly* 38, no. 4 (2 October 2015): 157, <https://doi.org/10.1080/0163660X.2015.1125835>. See also Marcus DuBois King, *Water and Conflict in the Middle East* (Oxford University Press, 2021).

Climate-related conflicts related to NSAG's can take various forms.

has also been described as a conflict which centers around NSAGs and central authorities competing with one another over access to increasingly scarce water resources.¹¹⁷

Climate-related conflicts related to NSAG's can take various forms. This includes terrorism in the forms of individual killings, large-scale attacks, or suicide bombings.¹¹⁸ Other forms include guerrilla warfare¹¹⁹ and insurgencies against the state,¹²⁰ both of which may escalate into civil war and become internationalized conflicts under select circumstances.¹²¹

117 Emily Atkin, 'Climate Change Is Aggravating the Suffering in Yemen', The New Republic, 2018, <https://newrepublic.com/article/152011/climate-change-aggravating-suffering-yemen>; Hadil Mohamed, Moosa Elayah, and Lau Schuplen, 'Yemen Between the Impact of the Climate Change and the Ongoing Saudi-Yemen War: A Real Tragedy' (Sana'a: Governance and Peace-building Center, Center for International Development Issues Nijmegen, Radboud University, 2017), https://www.kpsrl.org/sites/default/files/2018-03/a_real_tragedy%20%285%29.pdf.

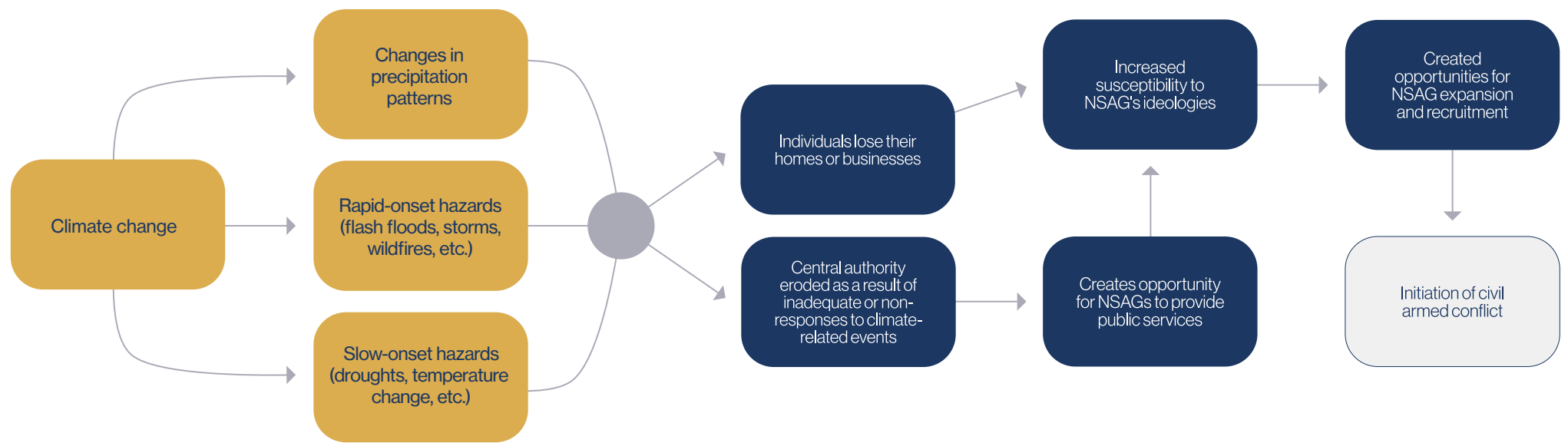
118 Caron, 'The Threat Multiplier', 25; Daniel Egiegbia Agbiboa, 'Why Boko Haram Exists: The Relative Deprivation Perspective', *African Conflict and Peacebuilding Review* 3, no. 1 (2013): 144–57, <https://doi.org/10.2979/africonfpeacrevi.3.1.144.no.1> (2013).

119 Caron, 'The Threat Multiplier', 20.

120 Caron, 'The Threat Multiplier'.

121 Specifically, a risk of escalation exists within contexts where localized conflict spills over borders or can be exploited by large geopolitical actors to secure strategic (regional or resource-related) objectives. See Hugo van Manen and Tim Sweijts, 'Military Competition in Perspective' (The Hague: The Hague Centre for Strategic Studies, 2019), <https://www.clingendael.org/pub/2019/strategic-monitor-2019-2020/military-competition-in-perspective/>.

Figure 4. Climate Change-Related Social Unrest Empowers Nonstate Armed Groups



Pathology 5:

Policies Aimed at Mitigating the Effects of Climate Change Have Adverse Effects

Climate change – particularly when combined with top-down decision-making – can trigger political exploitation and marginalization of groups, inequality, and conflict over resources.

Climate change, including slow onset changes in temperature, precipitation patterns, and rapid onset disasters – particularly when combined with top-down decision-making – can trigger political exploitation and marginalization of groups, inequality, and conflict over resources (see Table 8 and Figure 5). Whether environmental policies fuel conflict rather than averting it depends on (among others) state capacity,¹²² the availability of (international) regulatory and social justice mechanisms,¹²³ and the economic and ethnic cleavages already present in the country at stake.¹²⁴ Regions in which these dynamics are present include the Sahel,¹²⁵ Latin America,¹²⁶ and Asia.¹²⁷ The evidence and the literature exploring the link between adaptation and mitigation measures and conflict is, compared to other climate-security topics, relatively limited. The existing literature singles in on policies that fuel land grabbing and social vulnerability, thus inciting intra-state conflict.¹²⁸

Policies aiming to provide environmental protection can, instead of resolving conflict, incite violence.¹²⁹ Climate mitigation and adaptation policies have spiked in recent years as a consequence of global climate change agreements. These policies include biofuel production and Reducing Emissions from Deforestation and Forest Degradation (REDD+).¹³⁰ Environmental policies are often implemented without local communities' participation,¹³¹ and tend to overlook socio-political dynamics. Because of this, they can exacerbate preexisting social vulnerabilities. Policies such as these can also increase the risk of conflict initiating by facilitating elite capture and exploitation by non-state armed groups.¹³² In the Sahel region, governments have enlisted law enforcement measures – including forest services (paramilitary agencies tasked with enforcing conservation) – to protect the environment and natural resources.¹³³ These services operated under the command of political elites and acted with impunity against rural communities.¹³⁴ In several instances, they were shown to be engaged in exploitative activities,

122 Carol Hunsberger et al., 'Climate Change Mitigation, Land Grabbing and Conflict: Towards a Landscape-Based and Collaborative Action Research Agenda', *Canadian Journal of Development Studies / Revue Canadienne d'études Du Développement* 38, no. 3 (3 July 2017): 305–24, <https://doi.org/10.1080/02255189.2016.1250617>.

123 Jennifer Franco, Clara Mi Young Park, and Roman Herre, 'Just Standards: International Regulatory Instruments and Social Justice in Complex Resource Conflicts', *Revue Canadienne d'études Du Développement* 38, no. 3 (2017): 341–59, <https://doi.org/10.1080/02255189.2017.1298520>.

124 Hunsberger et al., 'Climate Change Mitigation, Land Grabbing and Conflict'.

125 Luca Raineri, 'Sahel Climate Conflicts? When (Fighting) Climate Change Fuels Terrorism' (Bietlot, Belgium: European Union Institute for Security Studies, December 2020), 3.

126 E.g. James Fairhead, Melissa Leach, and Ian Scoones, 'Green Grabbing: A New Appropriation of Nature?', *The Journal of Peasant Studies* 39, no. 2 (1 April 2012): 237–61, <https://doi.org/10.1080/03066150.2012.671770>.

127 See for example: Courtney Work and Ratha Thuon, 'Inside and Outside the Maps: Mutual Accommodation and Forest Destruction in Cambodia', *Canadian Journal of Development Studies / Revue Canadienne d'études Du Développement* 38, no. 3 (3 July 2017): 360–77, <https://doi.org/10.1080/02255189.2017.1309313>.

128 See for example: Franco, Park, and Herre, 'Just Standards'; Hunsberger et al., 'Climate Change Mitigation, Land Grabbing and Conflict'; Hunsberger et al.; Mucahid Mustafa Bayrak and Lawal Mohammed Marafa, 'Ten Years of REDD+: A Critical Review of the Impact of REDD+ on Forest-Dependent Communities', *Sustainability (Basel, Switzerland)* 8, no. 7 (2016): 620–, <https://doi.org/10.3390/su8070620>.

129 Raineri, 'Sahel Climate Conflicts? When (Fighting) Climate Change Fuels Terrorism'.

130 Hunsberger et al., 'Climate Change Mitigation, Land Grabbing and Conflict'.

131 Raineri, 'Sahel Climate Conflicts? When (Fighting) Climate Change Fuels Terrorism', 1; Ashish Aggarwal, 'How Sustainable Are Forestry Clean Development Mechanism Projects?—A Review of the Selected Projects from India', *Mitigation and Adaptation Strategies for Global Change* 19, no. 1 (1 January 2014): 73–91, <https://doi.org/10.1007/s11027-012-9427-x>. Belgium", "publisher": "European Union Institute for Security Studies", "publisher-place": "Bietlot, Belgium", "title": "Sahel Climate Conflicts? When (fighting

132 Raineri, 'Sahel Climate Conflicts? When (Fighting) Climate Change Fuels Terrorism', 1.

133 Benjaminsen et al., 'Does Climate Change Drive Land-Use Conflicts in the Sahel?'

134 Raineri, 'Sahel Climate Conflicts? When (Fighting) Climate Change Fuels Terrorism', 4.

Table 8. Policies Aimed at Mitigating the Effects of Climate Change Have Adverse Effects

| Pathology | Climate Factors | Mediating Factors | Conflict | Regions prominently featured in literature |
|-----------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|
| Climate change policies can trigger political exploitation and marginalization of groups, aggravating existing grievances and tensions. | Temperature increase, erratic and/or decreased rainfall. Rapid onset climate events such as floods, or (tropical) storms. | State capacity, degree of foreign development aid; top-down policy mechanisms, presence of non-state armed groups, ethnic fragmentation, political and economic marginalization, strength of civil society. | Terrorism, inter-communal violence, insurgencies and separatist movements against the state, state violence towards inhabitants. | Sahel, Latin America, Asia. |

including embezzlement, harassment, plunder, and abuse.¹³⁵ In Cambodia, climate change mitigation initiatives have been similarly shown to enflame old conflict and to fuel the initiation of new ones.¹³⁶ In Myanmar, conservation initiatives proposing land reforms have been criticized for exacerbating the ethnic tensions created by decades of civil war.¹³⁷

Another pathway through which initiatives to tackle climate change and its effects can contribute to the onset of conflict is in instances where international aid is deployed in response to rapid onset climate events. This form of aid can result in an unequal allocation of resources, increasing marginalization and frustration among disadvantaged communities. While international aid can mitigate a hazard's impacts or compensate for diminished state capacity, it can also induce instability and conflict. Local actors can co-opt foreign aid to consolidate and expand their power.¹³⁸ This is especially the case in weak or non-democratic states, which are less likely to prioritize equitable resource distribution than are their democratic counterparts.¹³⁹ Furthermore, in many countries, state actors must compete with non-state actors over control of foreign aid. Several cases underline the impact of competition for aid and legitimacy on state hostility toward civil society groups, resulting in targeting of specific groups and the seizing of their assets.¹⁴⁰ The unequal allocation of aid may further exacerbate public grievances and social tensions, creating further instability.¹⁴¹

Climate change's contribution to an increase in the risk of elite exploitation does not necessarily translate into an increased risk that *new* conflicts will break out. Rather, it increases the risk that existing disputes will escalate as a result of the aggravation of pre-existing tensions and grievances. The type of conflict risk that this pathology aggravates is thus varied, including terrorism, inter-group violence, insurgencies against the state, and civil conflict.

135 International Alert, 'If Victims Become Perpetrators: Factors Contributing to Vulnerability and Resilience to Violent Extremism in the Central Sahel', 2018, 32, https://www.international-alert.org/sites/default/files/Sahel_ViolentExtremismVulnerabilityResilience_EN_2018.pdf.

136 Franco, Park, and Herre, 'Just Standards'; Work and Thuon, 'Inside and Outside the Maps'.

137 Hunsberger et al., 'Climate Change Mitigation, Land Grabbing and Conflict'.

138 Reed M. Wood and Thorin M. Wright, 'Responding to Catastrophe: Repression Dynamics Following Rapid-Onset Natural Disasters', *Journal of Conflict Resolution* 60, no. 8 (2016): 3.

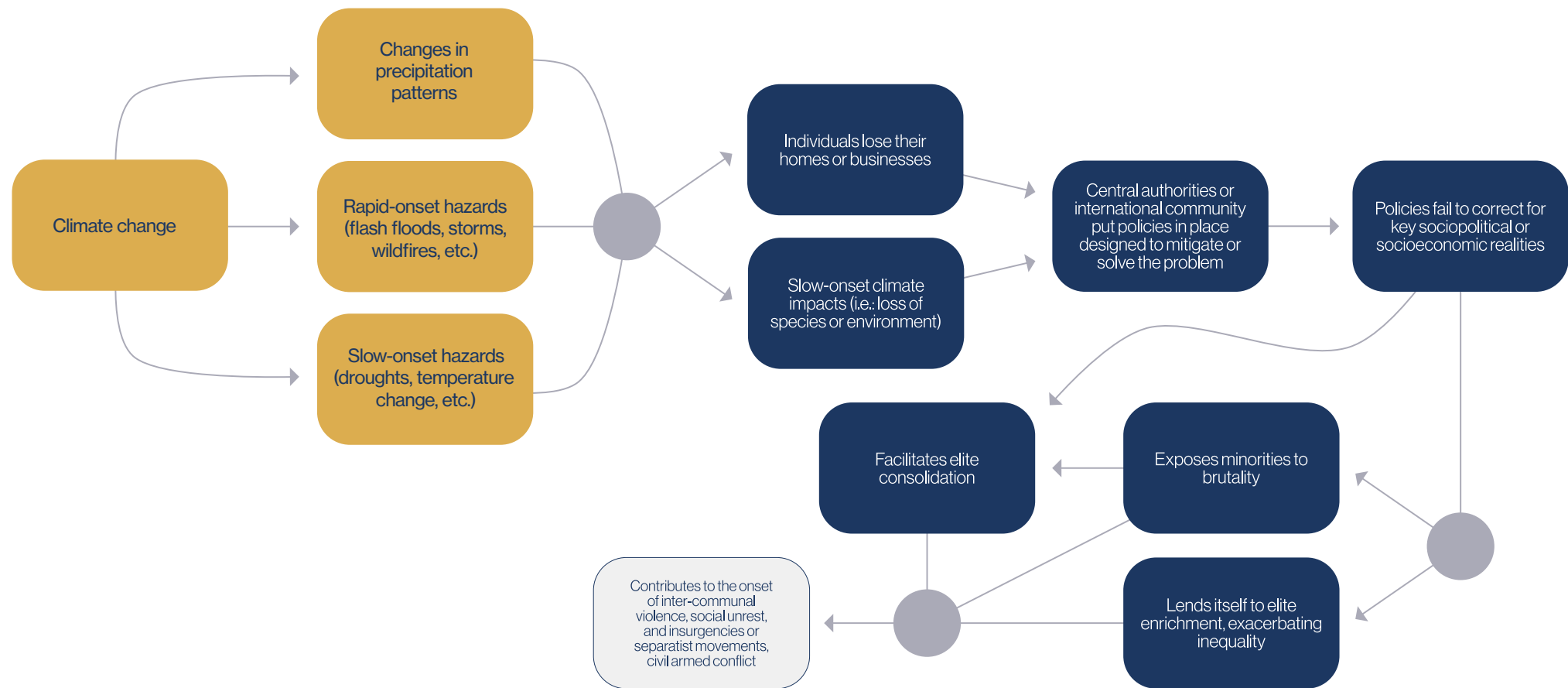
139 See Joseph Wright, 'To Invest or Insure?: How Authoritarian Time Horizons Impact Foreign Aid Effectiveness', *Comparative Political Studies* 41, no. 7 (1 July 2008): 971–1000, <https://doi.org/10.1177/0010414007308538>. See also Wood and Wright, 'Responding to Catastrophe', 10; Bruce Bueno De Mesquita and Alastair Smith, 'Leader Survival, Revolutions, and the Nature of Government Finance', *American Journal of Political Science* 54, no. 4 (2010): 936–50, <https://doi.org/10.1111/j.1540-5907.2010.00463.x>, which is modeled using Bueno de Mesquita and colleagues' (2003

140 Wood and Wright, 'Responding to Catastrophe', 6; Mark Pelling and Kathleen Dill, 'Disaster Politics: Tipping Points for Change in the Adaptation of Sociopolitical Regimes', *Progress in Human Geography* 34, no. 1 (2010): 21–37, <https://doi.org/10.1177/0309132509105004>.

141 Wood and Wright, 'Responding to Catastrophe', 10.

Local actors can co-opt foreign aid to consolidate and expand their power.

Figure 5. Policies Aimed at Mitigating the Effects of Climate Change Have Adverse Effects



Pathology 6:

Climate Change-Related Social Unrest Precipitates Large-Scale Political Movements, Provoking a Government Crackdown

Natural climate hazards can exacerbate grievances, overstretch state capacity, and create a window of opportunity for violent challenges to state control as well as for state violence against citizens.

Natural climate hazards can exacerbate grievances, overstretch state capacity, and create a window of opportunity for violent challenges to state control as well as for state violence against citizens (see Table 9 and Figure 6). This is especially the case in the context of low socio-economic development,¹⁴² weak infra- and communication structures,¹⁴³ weak state capacity,¹⁴⁴ ethnic polarization,¹⁴⁵ and a civil society that is able to self-organize.¹⁴⁶ Less developed regions with autocratic regimes are the regions that are at the highest risk, followed by weak democracies.¹⁴⁷ It is important to note that “strong” democratic societies are not immune to this dynamic either.

The literature linking climate change-related natural hazards to conflict does not provide clear evidence that hazards directly increase the onset of conflict.¹⁴⁸ Rather, scholars highlight that hazards have a destabilizing impact which is mediated by often unspecified economic, political, demographic, and geographic variables. Hazards can prolong the duration of an existing conflict,¹⁴⁹ aggravate existing grievances, and contribute to insurgencies against the state.¹⁵⁰ These movements can incur state repression, something which carries with it the risk of an escalation into civil war.¹⁵¹

Natural hazards can shift a state's domestic political status quo by increasing fragility, diminishing state capacity, and mobilizing non-state actors. Natural climate hazards are most destabilizing in countries with low economic development and low state capacity.¹⁵² Hazards further challenge the state's ability to maintain authority over the affected areas and to communicate and coordinate security and policing efforts.¹⁵³ After Typhoon Haiyan in the Philippines in 2013, in the city Tacloban, only 10% of the city's police appeared for duty the following week. At the same time, the states' inability to effectively respond to climate hazards and provide citizens with basic needs and security provided a focal point for popular

142 Matthew E. Kahn, 'The Death Toll from Natural Disasters: The Role of Income, Geography, and Institutions', *The Review of Economics and Statistics* 87, no. 2 (2005): 271–84, <https://doi.org/10.1162/0034653053970339>; Michael Brzoska, 'Weather Extremes, Disasters, and Collective Violence: Conditions, Mechanisms, and Disaster-Related Policies in Recent Research', *Current Climate Change Reports* 4, no. 4 (2018): 320–29, <https://doi.org/10.1007/s40641-018-0117-y>.

143 Kahn, 'The Death Toll from Natural Disasters'.

144 Wood and Wright, 'Responding to Catastrophe', 3; Kahn, 'The Death Toll from Natural Disasters'.

145 Brzoska, 'Weather Extremes, Disasters, and Collective Violence'.

146 Wood and Wright, 'Responding to Catastrophe'.

147 Sebastian Levi, 'Country-Level Conditions like Prosperity, Democracy, and Regulatory Culture Predict Individual Climate Change Belief', *Communications Earth & Environment* 2, no. 1 (26 February 2021): 1–10, <https://doi.org/10.1038/s43247-021-00118-6>.

148 Koubi, 'Climate Change and Conflict'.

149 Ramesh Ghimire and Susana Ferreira, 'Floods and Armed Conflict', *Environment and Development Economics* 21, no. 1 (2016): 23–52, <https://doi.org/10.1017/S1355770X15000157>.

150 Joshua Eastin, 'Hell and High Water: Precipitation Shocks and Conflict Violence in the Philippines', *Political Geography* 63 (1 March 2018): 116–34, <https://doi.org/10.1016/j.polgeo.2016.12.001>.

151 Wood and Wright, 'Responding to Catastrophe'.

152 Kahn, 'The Death Toll from Natural Disasters'.

153 Wood and Wright, 'Responding to Catastrophe', 6; Brzoska, 'Weather Extremes, Disasters, and Collective Violence'.

Table 9. Climate Change-Related Social Unrest Precipitates Large-Scale Political Movements, Provoking a Government Crackdown

| Pathology | Climate Factors | Mediating Factors | Conflict | Regions prominently featured in literature |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|
| Climate hazards can provoke a window of opportunity for violent and non-violent opposition to further undermine authorities. This erodes state capacity and exacerbates social vulnerability. Conflict arises as a result of the state's (violent) crackdown on dissent. | Rapid onset hazards as floods, storms, and landslides. | State capacity, economic development, infrastructure and communication structures, ethnic polarization, strength of civil society. | Social unrest, rioting, terrorism, and state violence against citizens, as well as armed civil conflict. | Africa (Sahel, Sub-Saharan), Middle East, Asia, Latin America. |

dissatisfaction and mobilization against authorities. When states are slow or unable to respond to climate disasters, civil society organizations often fill the void. In doing so, they usurp the state's authority and undermine state legitimacy, in turn strengthening their legitimacy. The decline of state policing capacity creates space for resistance to the government and the expression of grievances in society, including grievances generated by the disaster itself and those that preceded the disaster.¹⁵⁴ Resulting resistance movements can be both violent¹⁵⁵ and nonviolent.¹⁵⁶ The archetypal example is Haiti after the major hurricanes of 2004 and 2008, which resulted in a high number of casualties. Each hurricane decreased the government's capacity, and consequently increased violence, as the country's ruling parties struggled to maintain order.¹⁵⁷ Another example can be observed in Ghana. In June 2015, severe rainfall led to floods in the country's capital, Accra. The floods demolished neighborhoods and left entire communities homeless. The informal settlements in the slums had congested waterways, aggravating the impact of the floods. Following the floods, the government ordered the removal of informal settlements in an area at high risk of floods. This decision resulted in a wave of violence against the incumbent party.¹⁵⁸

The impact of natural hazards and the extent to which they contribute to instability depends on the political and institutional context,¹⁵⁹ as well as on states' decisions about how to best manage uncertainty and potential threats to stability amid unexpected climatic shocks. Disasters can embolden anti-state actors by employing community organizations and alliance

154 Vincent T. Gawronski and Richard Stuart Olson, 'Disasters as Crisis Triggers for Critical Junctures? The 1976 Guatemala Case', *Latin American Politics and Society* 55, no. 2 (ed 2013): 133–49, <https://doi.org/10.1111/j.1548-2456.2013.00196.x>.

155 Claude Berrebi and Jordan Ostwald, 'Earthquakes, Hurricanes, and Terrorism: Do Natural Disasters Incite Terror?', *Public Choice* 149, no. 3/4 (2011): 383–403, <https://doi.org/10.1007/s11127-011-9868-x>; Philip Nel and Marjolein Righarts, 'Natural Disasters and the Risk of Violent Civil Conflict', *International Studies Quarterly* 52, no. 1 (2008): 159–85, <https://doi.org/10.1111/j.1468-2478.2007.00495.x>.

156 De Mesquita and Smith, 'Leader Survival, Revolutions, and the Nature of Government Finance'; A. Cooper Drury and Richard Stuart Olson, 'Disasters and Political Unrest: An Empirical Investigation', *Journal of Contingencies and Crisis Management* 6, no. 3 (1998): 153–61, <https://doi.org/10.1111/1468-5973.00084>. which is modeled using Bueno de Mesquita and colleagues' (2003)

157 Rüttinger et al., 'A New Climate for Peace: Taking Action on Climate and Fragility Risks', 36; Bureau for Crisis Prevention and Recovery, 'Disaster-Conflict Interfaces: Comparative Experiences' (United Nations Development Programme, 2011).

158 Erik Plänitz, 'Neglecting the Urban? Exploring Rural-Urban Disparities in the Climate Change–Conflict Literature on Sub-Saharan Africa', *Urban Climate* 30 (1 December 2019): 100533, <https://doi.org/10.1016/j.uclim.2019.100533>.

159 Wood and Wright, 'Responding to Catastrophe', 3; Kahn, 'The Death Toll from Natural Disasters'.

The loss of state capacity and legitimacy following natural hazards, particularly when combined with a violent crackdown on dissent, can result in violent conflict.

building, thereby reshaping the domestic political environment. As dissent and instability increase, state authorities may be induced to employ coercive measures to reassert control and deter further threats to power.¹⁶⁰ The impact of endogenous shocks on state repressive behavior is evident in both autocratic and democratic states as the case of Hurricane Katrina in the United States illustrates.¹⁶¹ Following Hurricane Katrina in 2005, abuses were reported by human rights groups in and around New Orleans, including imprisonment for minor infractions like curfew violations, often without formal charge or processing.¹⁶²

Natural hazards can cultivate violent or non-violent social unrest, riots,¹⁶³ and terrorism.¹⁶⁴ As the domestic political status quo changes and states grapple to maintain control in a situation characterized by chaos, state violence against citizens can increase.¹⁶⁵ The loss of state capacity and legitimacy following natural hazards, particularly when combined with a violent crackdown on dissent, can result in violent conflict.¹⁶⁶ When natural hazards occur shortly after a country has grappled with violence, intergroup inequality, or societal or ethnic tensions, they can foment larger-scale civil armed conflict.¹⁶⁷

160 Wood and Wright, 'Responding to Catastrophe', 3; Christian Davenport, 'State Repression and Political Order', *Annual Review of Political Science* 10, no. 1 (2007): 7, <https://doi.org/10.1146/annurev.polisci.10.101405.143216>. conflict, coercion, order State repression includes harassment, surveillance/spying, bans, arrests, torture, and mass killing by government agents and/or affiliates within their territorial jurisdiction. Over the past 40 years, the systematic study of state repression has grown considerably. The development of this work, however, has been uneven. Though unified in their focus on the problem of order (i.e., trying to ascertain how political authorities wield coercive power amid potential and actual domestic challengers

161 Wood and Wright, 'Responding to Catastrophe', 4.

162 Wood and Wright, 19; Amnesty International USA, 'Un-Natural Disaster: Human Rights in the Gulf Coast', February 2010, <https://www.amnestyusa.org/files/pdfs/unnaturaldisaster.pdf>; Pamela R. Metzger, 'Doing Katrina Time Hurricane Katrina Symposium: Reshaping the Legal Landscape of the Gulf South: Criminal Law', *Tulane Law Review* 81, no. 4 (2007 2006): 1175–1218.

163 De Mesquita and Smith, 'Leader Survival, Revolutions, and the Nature of Government Finance' which is modeled using Bueno de Mesquita and colleagues' (2003

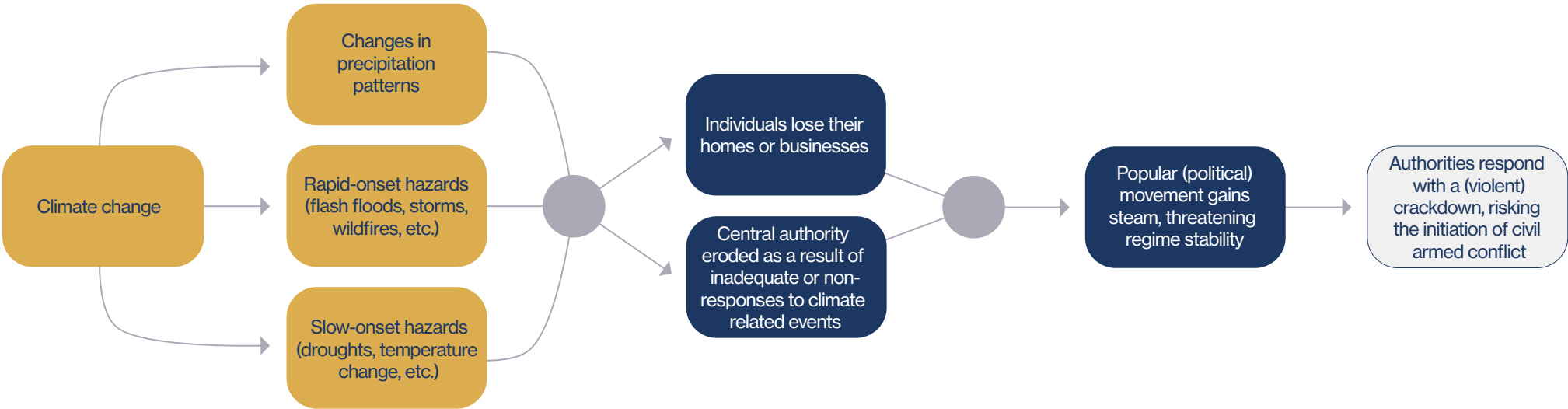
164 Berrebi and Ostwald, 'Earthquakes, Hurricanes, and Terrorism'.

165 Nel and Righarts, 'Natural Disasters and the Risk of Violent Civil Conflict'.

166 Brzoska, 'Weather Extremes, Disasters, and Collective Violence', 325; Chun-Ping Chang and Aziz N. Berdiev, 'Do Natural Disasters Increase the Likelihood That a Government Is Replaced?', *Applied Economics* 47, no. 17 (2015): 1788–1808, <https://doi.org/10.1080/00036846.2014.1002894>.

167 Frederick C. Cuny, *Disasters and Development* (Oxford University Press, 1983), 54.

Figure 6. Climate Change-Related Social Unrest Precipitates Large-Scale Political Movements, Provoking a Government Crackdown



Pathology 7:

Disputes Over Transboundary Resources Cascade into Interstate Conflict

Climate change makes new resources available and increases the scarcity of existing resources, thereby increasing both inter and intra-state competition over these resources (see Table 10 and Figure 7). This can heighten intrastate tensions in three ways; namely: a) water scarcity strains relations over transboundary freshwater resources, b) temperature increase creates a new frontier for disputes in the Arctic, and c) diplomatic disputes can arise over climate mitigation measures and responsibility. These dynamics are mediated by political, social, economic, and geographic contexts. The risk that transboundary water resources will trigger disputes is increased by political instability,¹⁶⁸ the level of economic development,¹⁶⁹ water management structures,¹⁷⁰ the size of the shared river basin,¹⁷¹ population density,¹⁷² existing cooperation and diplomatic relations,¹⁷³ and whether these countries are located in an arid climate.¹⁷⁴ Yoffe et al. (2003) identified four “hot spot areas” which have a high risk of future inter-state conflict over transboundary waters, including the Aral Sea, the River Jordan, the Nile River, the Tigris-Euphrates.¹⁷⁵

The link between climate change, shared water resources, and conflict, as prominent as it has been in political rhetoric, has not garnered robust evidence within the existing literature. Some research has found water stress to not be a significant indicator of dispute.¹⁷⁶ Shared interests over transboundary water resources foster cooperation rather than increasing the risk of conflict initiating. Others concluded water resources can fuel both cooperation and low-level inter-and intra-state conflict.¹⁷⁷ More recent studies have found that higher aridity increases the likelihood of cooperation rather than conflict.¹⁷⁸ Nonetheless, past cases show that water scarcity, particularly when combined with transboundary river management, can heavily strain relations between states. Egypt, for example, has threatened to resort to war to guarantee water flow on the Nile.¹⁷⁹ Similarly, South African support for a coup against Lesotho’s tribal government has been attributed to Lesotho’s refusal to divert water from its mountains to South Africa.¹⁸⁰

The link between climate change, shared water resources, and conflict, as prominent as it has been in political rhetoric, has not garnered robust evidence within the existing literature.

168 Thomas Bernauer and Tobias Siegfried, ‘Climate Change and International Water Conflict in Central Asia’, *Journal of Peace Research* 49, no. 1 (2012): 227–39, <https://doi.org/10.1177/0022343311425843>.

169 Nils Petter Gleditsch et al., ‘Conflicts over Shared Rivers: Resource Scarcity or Fuzzy Boundaries?’, *Political Geography*, Special Issue: Conflict and Cooperation over International Rivers, 25, no. 4 (1 May 2006): 361–82, <https://doi.org/10.1016/j.polgeo.2006.02.004>; Shim Yoffe, Aaron T. Wolf, and Mark Giordano, ‘Conflict and Cooperation Over International Freshwater Resources: Indicators of Basins at Risk’, *JAWRA Journal of the American Water Resources Association* 39, no. 5 (2003): 1109–26, <https://doi.org/10.1111/j.1752-1688.2003.tb03696.x>.

170 Bernauer and Siegfried, ‘Climate Change and International Water Conflict in Central Asia’, 237.

171 Gleditsch et al., ‘Conflicts over Shared Rivers’.

172 Yoffe, Wolf, and Giordano, ‘Conflict and Cooperation Over International Freshwater Resources’.

173 Yoffe, Wolf, and Giordano.

174 Gleditsch et al., ‘Conflicts over Shared Rivers’.

175 Yoffe, Wolf, and Giordano, ‘Conflict and Cooperation Over International Freshwater Resources’, 1123.

176 Yoffe, Wolf, and Giordano, ‘Conflict and Cooperation Over International Freshwater Resources’.

177 Gleditsch et al., ‘Conflicts over Shared Rivers’, 379.

178 Devlin and Hendrix, ‘Trends and Triggers Redux’.

179 Homer-Dixon, *Environment, Scarcity, and Violence*, 139.

180 Homer-Dixon, 140.

Table 10. Disputes Over Transboundary Resources Cascade into Interstate Conflict

| Pathology | Climate Factors | Mediating Factors | Conflict | Regions prominently featured in literature |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| Climate change can foster tensions over trans-boundary resources in three main ways: 1) water scarcity raises tensions over transboundary fresh-water resources; 2) temperature increases create a new frontier for disputes in the Arctic; 3) diplomatic disputes over climate mitigation measures and responsibility. | Temperature increase, decreased or erratic precipitation, droughts. | Economic development, size of the shared river basin, population density, existing diplomatic relations, water management structures, political instability. | Diplomatic tensions, local conflict, in extreme cases this can instigate interstate conflict. | 1) Arid regions with major cross-boundary river basins, such as the Nile River, the River Jordan, and the Euphrates-Tigris; 2) the Arctics. |

The literature on competition over Arctic resources is more theoretical and speculative in nature. This is because climate change has only recently contributed to the Arctics' natural resources starting to become more easily accessible. As a result, empirical evidence for this pathway remains limited. Disagreements are largely structured across theoretical lines. Realists expect a geopolitical gold rush while neo-liberalists identify possible disputes over appropriate governance mechanisms. For instance, Keil (2014) finds that the Arctic's resources are of strategic importance to Denmark/Greenland, the USA, Canada, Russia, and Norway, but concludes that a geopolitical rush for resources is unlikely to occur.¹⁸¹ Parmar (2013) however, explores the growing militarization of the Arctic region, pointing out that it increases the risk of a conflict breaking out.¹⁸²

Transboundary Water Resources

Rising temperatures and decreased precipitation, coupled with population growth, increase water scarcity. As most of the world's freshwater runs through international rivers, excess demand can result in disputes over transboundary water resources. This also stems from the fact that the relationship between riparian countries is inherently asymmetric: any action by an upstream state may have direct externalities for downstream states.¹⁸³ Factors influencing the likelihood of conflict over transboundary water resources include poverty, political instability, as well as the severity of climatic changes.¹⁸⁴ A strong international water management regime has been seen to mitigate the risk of inter-state conflict.¹⁸⁵

181 Kathrin Keil, 'The Arctic: A New Region of Conflict? The Case of Oil and Gas', *Cooperation and Conflict* 49, no. 2 (1 June 2014): 162–90, <https://doi.org/10.1177/0010836713482555>.

182 Sarabjeet Singh Parmar, 'The Arctic: Potential for Conflict amidst Cooperation', *Strategic Analysis* 37, no. 4 (1 July 2013): 480–85, <https://doi.org/10.1080/09700161.2013.802521>.

183 Marit Brochmann and Nils Petter Gleditsch, 'Shared Rivers and Conflict – A Reconsideration', *Political Geography* 31, no. 8 (2012): 520, <https://doi.org/10.1016/j.polgeo.2012.11.001>.

184 Bernauer and Siegfried, 'Climate Change and International Water Conflict in Central Asia'.

185 Shlomi Dinar et al., 'Climate Change, Conflict, and Cooperation: Global Analysis of the Effectiveness of International River Treaties in Addressing Water Variability', *Political Geography* 45 (2015): 55–66, <https://doi.org/10.1016/j.polgeo.2014.08.003>; M. K. Mahlakeng and Hussein Solomon, 'An Analysis of Regime Capacity and a Nascent Environmental Conflict in the Niger River Basin', *Southern Journal for Contemporary History* 42, no. 2 (2017): 180–207, <https://doi.org/10.18820/24150509/JCH42.v2.9>.

Any action by an upstream state may have direct externalities for downstream states.

Climate change has set in motion the erosion of the Arctic icecap, making previously inaccessible resources and territories accessible for exploitation.

As yet, there are no examples of full-blown interstate armed conflicts that erupted exclusively over transboundary water resources. However, the start of the 1967 war in the Middle East, while heavily debated, is also partially attributed to Arab states' efforts to divert waters from the Jordan River away from Israel.¹⁸⁶ Moreover, there are ample examples of diplomatic disputes and lower intensity conflicts, mainly following upstream actions that hinder fresh-water flows to downstream states, such as dam construction or water contamination. Among the most infamous examples are the diplomatic dispute between Egypt, Ethiopia, and Sudan over dam construction on the Nile River,¹⁸⁷ and the tensions between Turkey, Syria, Iraq, and Iran over dam construction on the Euphrates and the Tigris.¹⁸⁸ Transboundary water management, coupled with climate-induced water scarcity, also has the potential of generating local conflict. Upstream actions can intensify local grievances and competition over already scarce water resources, which can lead to social unrest and intercommunal violence. For example, in 2018, in the Iraqi province of Basra, riots and protests spread after more than 30,000 people were hospitalized as a result of drinking polluted water.¹⁸⁹ The water pollution and scarcity were a combined result of local pollution and mismanagement, climate change, and upstream Iranian, Iraqi, Turkish, and Syrian water management projects.¹⁹⁰

A New Frontier for Conflict in the Arctic

Rising temperatures and altered weather conditions also create new frontiers for conflict, in particular in the Arctic. Climate change has set in motion the erosion of the Arctic icecap, making previously inaccessible resources and territories accessible for exploitation. Not only has it been estimated that 1670 trillion cubic feet of natural gas and 44 billion cubic feet of liquid natural gas are located in the Arctic Circle;¹⁹¹ the melting of the icecap is also likely to open new trade routes. This has consequences for both control over resources and for strategic military positioning. As demand for energy resources increases, this could lead countries to secure resources by force.¹⁹²

A second potential source of conflict involves strategic military positioning, including sea lines of communication (SLOC's), and forward basing. SLOC's are primary routes in which maritime transportation, shipping and navies can move freely around the world. Well-known critical SLOC's are the Suez Canal, the Strait of Gibraltar, and the Panama Canal. Newly opened Arctic routes, such as the Northern Sea Route, have the potential of gaining vital strategic importance. This notwithstanding, it remains unclear which states will have access and/or control over these regions. For instance, Article 234 of the United Nations Convention on the

186 Brochmann and Gleditsch, 'Shared Rivers and Conflict – A Reconsideration'; Arun P. Elhance, *Hydropolitics in the Third World: Conflict and Cooperation in International River Basins* (US Institute of Peace Press, 1999). Note however, that this is a disputed statement.

187 Fred H. Lawson, 'Egypt versus Ethiopia: The Conflict over the Nile Metastasizes', *The International Spectator* 52, no. 4 (2017): 129–44, <https://doi.org/10.1080/03932729.2017.1333272>.

188 Pacific Institute, 'Water Conflict Chronology Timeline List', *The World's Water: Information on the World's Freshwater Resources*, 2021, <http://www.worldwater.org/conflict/list/>; Sameh W. Al-Muqaddi et al., 'Dispute over Water Resource Management—Iraq and Turkey', *Journal of Environmental Protection* 7, no. 8 (30 June 2016): 1096–1103, <https://doi.org/10.4236/jep.2016.78098>.

189 Haider al-Abadi, 'Calm Returns to Basra after Week of Violent Protests', Al-Jazeera, 9 September 2018, <https://www.aljazeera.com/news/2018/9/9/iraq-calm-returns-to-basra-after-week-of-violent-protests>.

190 Glada Lahn and Nouar Shamout, 'Basra's Poisonous Water Demands International Action', Chatham House, 14 November 2018, <https://www.chathamhouse.org/2018/11/basras-poisonous-water-demands-international-action>.

191 Kevin W. Riddle, 'U.S. National Arctic Strategy: Preparing Defensive Lines of Effort for the Arctic' (NATIONAL DEFENSE UNIV NORFOLK VA JOINT FORCES STAFF COLLEGE, 1 April 2014), <https://apps.dtic.mil/sti/citations/ADA600206>.

192 Riddle.

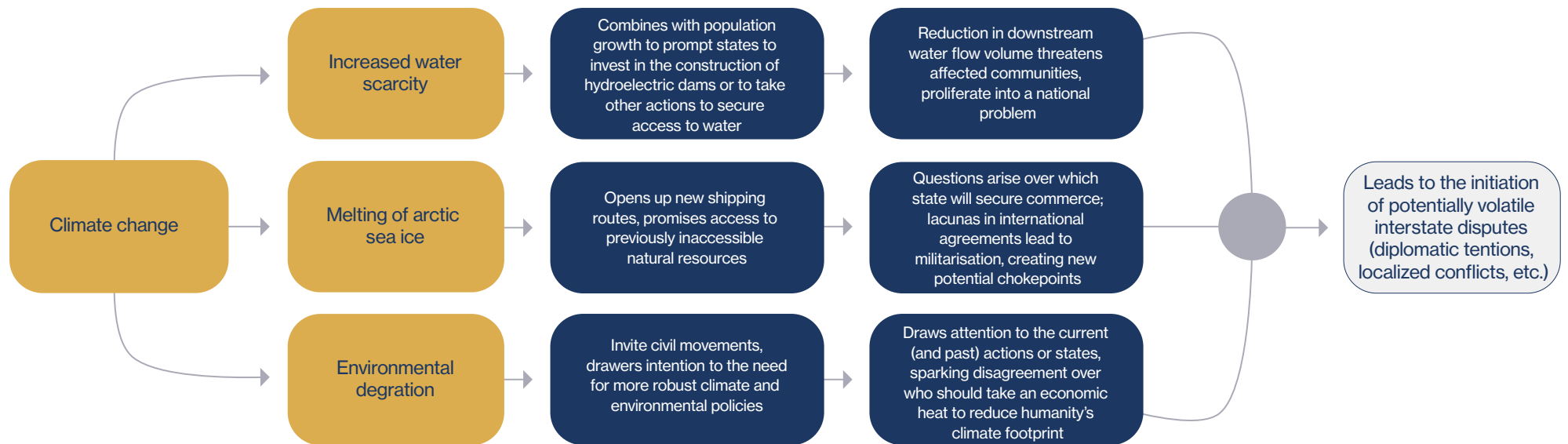
Law of the Sea allows countries to adopt 'ice-covered areas' into the limits of their exclusive economic zones' enhanced control mechanisms. Russia interprets this as granting it the right to control the Northern Sea Route along the Russian northern coast. Yet, with the melting of the cap, it becomes questionable whether Article 234 applies and the risk increases Russia will seek action to ensure its control. This could escalate tensions between Russia and NATO.¹⁹³

Tensions in Climate Diplomacy

Ultimately, a relatively stable climate can itself be seen as a global resource or a global common good. Thus, as the consequences of temperature rise become more prevalent around the globe and an increase of (more than) 2 degrees Celsius becomes increasingly likely, diplomatic tensions over issues such as who bears responsibility for global climate change are likely to rise. While this is unlikely to directly invoke armed conflict, it can worsen diplomatic relations. Illustrative is the clash between French President Macron and Brazilian President Bolsonaro over the management of the Amazon rainforest. Macron stated that the forest fires happening under Bolsonaro's regime constituted an international crisis and ecocide, as he considered the Amazon to be 'the lungs of the earth'.¹⁹⁴

193 RAND Corporation, 'Potential Drivers of Crises in the Arctic', 2021, <https://www.rand.org/pubs/visualizations/DVA1007-1/arctic-2030.html>.

194 Reuters, 'France's Macron Says Real "ecocide" Going on in Amazon', *Reuters*, 23 August 2019, sec. Environment, <https://www.reuters.com/article/us-g7-summit-amazon-idUSKCN1VD2AM>.

Figure 7. Disputes Over Transboundary Resources Cascade into Interstate Conflict

4. Findings and Conclusions

Climate change can function as a pathogen, breeding risk in often already vulnerable societies. The climate-related conflict pathologies outlined in this research paper provide a contribution to the body of literature exploring the nexus between climate change and insecurity, and between climate change and the onset of various forms of violent conflict more specifically. The pathologies are summarized in Table 11.

Though a rich variety of in-depth case analyses and larger n-studies documenting the relationship between climate change and violent conflict exists, researchers have traditionally refrained from attempting to conceptualize the causal pathways that lead from climate change to violent conflict in a comprehensive manner. Explicit and formal descriptions of the mechanisms linking the two remain few and far between. This study's principal contribution is therefore the set of seven climate-related conflict pathologies that describe these mechanisms.

The set of pathologies presented in this study improves on previous attempts in two principal ways. First, it incorporates a larger range of climate-related conflict pathologies than does any other single publication. Second, the comprehensive outlining of mediating factors greatly increases the granularity of the literature's ability to describe pathologies and to differentiate between the causal mechanisms underlying different types of conflict. This study's description of a wider range of pathologies, combined with a comprehensive overview of relevant mediating factors, provides relevant levers both for future research and for future policymaking.

For future research, it facilitates the formulation of and subsequent testing of more specific regional climate-related conflict hypotheses. It also allows for the development of a deeper understanding of how pathologies feed into one-another. Most importantly, the individual pathologies can be further refined and corroborated using various methods and analytical techniques. In depth case studies involving desk data analysis, field surveys, stakeholder interviews and process tracing, can be applied in conjunction with quantitative methodological approaches including first and foremost causal modelling – a new quantitative approach to extract the causal dynamics within a system of variables, identify the pathways that constitute causal relations and quantify causal effects – to formally test and corroborate the causal mechanisms described in these pathologies can be applied.¹⁹⁵ The research team will do both. It will conduct in depth field research on climate related conflict in Iraq which will be complemented by the application of formal causal modelling to formally describe these mechanisms. The results of this work are expected in 2022.

This study also offers relevant levers for policymakers. The mediating factors associated with each of the climate-related conflict pathologies outlined in this paper can be actively targeted

¹⁹⁵ For the 'seminal' book on this, see: Pearl, J. (2009). *Causality*. Cambridge university press. For more recent advances see: Bareinboim, E., & Pearl, J. (2016). Causal inference and the data-fusion problem. *Proceedings of the National Academy of Sciences*, 113(27), 7345-7352.

Climate change can function as a pathogen, breeding risk in often already vulnerable societies.

to proactively reduce the risk of climate change resulting in the onset of conflict in vulnerable states. The case studies that have been examined to arrive at and synthesize the pathologies in this report all provide examples of situations where things have gone wrong: climate change has contributed to the onset of violent conflict. Because the mediating factors that lead to these outcomes have been catalogued, policymakers can feasibly design policies geared towards preventing them from contributing to cascades into violent conflict going forward.

Table 11. Climate-Related Conflict Pathologies

| # | Title | Description | Climate Factors | Factors | Type of Conflict | Regions prominently featured in literature |
|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Climate Change-Related Resource Scarcity Leads to Conflict Between Pastoralist and Sedentary Communities | Changes in temperature and precipitation cause forms of scarcity that force pastoralist groups to alter their transhumance routes. This precipitates resource competition between groups, infringes on traditional customary regulations, and increases conflict risk. | Temperature increase, erratic and/or decreased rainfall, droughts, heatwaves. | Resource scarcity, dependence upon agriculture, political and economic marginalization, customary laws and dispute resolution mechanisms, inter-group inequality, presence of water irrigation projects or other forms of human resource use. | Local and lower intensity inter-communal violence. | Africa, Middle East, Central Asia. |
| 2 | Climate Change-Related Resource Scarcity Leads to Larger-Scale Inter-Communal Violence | Climate change-induced scarcity of water, food, and land resources, in combination with social, political, geographic, and economic variables, can trigger inter-communal tensions. | Temperature increase, decreased or erratic precipitation, droughts, heatwaves, and other extreme weather events. | Level of socio-economic development, dependence upon (rain-fed) agriculture, timing (growing-season or not), political instability, demographic pressure, water and road infrastructure, power-sharing arrangements, ethnic fragmentation, political and economic marginalization. | Local, inter-communal, inter-ethnic violence; civil unrest. | Middle East, Sahel and Sub-Saharan Africa, Central and Latin America, Asia. |
| 3 | Climate Change Precipitates Internal Migration, Leading to Social Unrest | Climate change can lead to migration, whether from rural to urban areas or between rural areas. This can spark social unrest by increasing resource competition and exacerbating feelings of relative deprivation, as well as the severity of inter-cultural clashes. | Rapid onset hazards such as floods, storms, and forest fires. Slow onset hazards such as temperature change, precipitation decrease, and drought. | Institutional capacity, resource scarcity, level of socio-economic development, ethnic fragmentation, demographic growth. | Local and low-intensity conflict, such as social unrests, riots, protesting, and inter-ethnic violence. | Africa, Middle East and North Africa, South Asia, Latin America. |
| 4 | Climate change interacts with state fragility and contributes to livelihood deterioration, creating fertile ground for the emergence and expansion of non-state armed groups (NSAGs) | Temperature increase, erratic and/or decreased rainfall. Extreme weather events such as heatwaves, floods, or storms. | State fragility, dependence upon (rain-fed) agriculture, resource scarcity, level of economic development, quality of infrastructure and public services, unemployment, presence of non-state armed groups, degree of ethnic fragmentation, economic and political marginalization. | Civil armed conflict, including terrorism, guerrilla warfare and insurgencies against the state. Many of these forms of conflict can become internationalized given the correct circumstances. | Africa (Sahel, Sub-Saharan), Middle East, Asia, Latin America. | Climate change interacts with state fragility and contributes to livelihood deterioration, creating fertile ground for the emergence and expansion of non-state armed groups (NSAGs). |

Table 11. Climate-Related Conflict Pathologies (continued)

| # | Title | Description | Climate Factors | Factors | Type of Conflict | Regions prominently featured in literature |
|---|---------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| 5 | Policies Aimed at Mitigating the Effects of Climate Change Have Adverse Effects | Climate change policies can trigger political exploitation and marginalization of groups, aggravating existing grievances and tensions. | Temperature increase, erratic and/or decreased rainfall. Rapid onset climate events as floods, or (tropical) storms. | State capacity, degree of foreign development aid; top-down policy mechanisms, presence of non-state armed groups, ethnic fragmentation, political and economic marginalization, strength of civil society. | Terrorism, inter-communal violence, insurgencies and separatist movements against the state, state violence towards inhabitants. | Sahel, Latin America, Asia. |
| 6 | Climate Change-Related Social Unrest Precipitates Large-Scale Political Movements, Provoking a Government Crackdown | Climate hazards can provoke a window of opportunity for violent and non-violent opposition to further undermine authorities. This erodes state capacity and exacerbates social vulnerability. Conflict arises as a result of the state's (violent) crackdown on dissent. | Rapid onset hazards as floods, storms, and landslides. | State capacity, economic development, infrastructure and communication structures, ethnic polarization, strength of civil society. | Social unrest, rioting, terrorism, and state violence against citizens, as well as armed civil conflict. | Africa (Sahel, Sub-Saharan), Middle East, Asia, Latin America. |
| 7 | Disputes Over Transboundary Resources Cascade into Interstate Conflict | Climate change can foster tensions over transboundary resources in three main ways: 1) water scarcity raises tensions over transboundary freshwater resources; 2) temperature increases create a new frontier for disputes in the Arctic; 3) diplomatic disputes over climate mitigation measures and responsibility. | Temperature increase, decreased or erratic precipitation, droughts. | Economic development, size of the shared river basin, population density, existing diplomatic relations, water management structures, political instability. | Diplomatic tensions, local conflict, in extreme cases this can instigate interstate conflict. | 1) Arid regions with major cross-boundary river basins, such as the Nile River, the River Jordan, and the Euphrates-Tigris; 2) the Arctic. |

5. Annexes

Annex I: Boolean Search Terms

| # | Search String |
|----|---------------------------------------------------------------------|
| 1 | "Climate change" AND conflict |
| 2 | "Climate change" AND "violent conflict" |
| 3 | Environment AND conflict |
| 4 | Environment AND "violent conflict" |
| 5 | "Climate change" AND violence |
| 6 | Environment AND "armed conflict" |
| 7 | "Environmental degradation" AND "armed conflict" AND quantifying |
| 8 | Climate AND Security |
| 9 | Environment AND Security |
| 10 | Drought AND conflict |
| 11 | Drought AND Security |
| 12 | Rainfall AND conflict |
| 13 | Rainfall AND security |
| 14 | Rainfall AND "armed conflict" |
| 15 | Rainfall AND violence |
| 16 | "Climate-conflict nexus" |

Annex II:

Overview of Consulted Literature

| Articles | Time period | Geographic spread | Number of citations/ relevance |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------------------------|-----------------------------------|
| Adano et. Al. Climate Change, Violent Conflict and Local Institutions in Kenya's Drylands | 2012 | Kenya | 293 |
| Agbiboa: Why Boko Haram Exists: The Relative Deprivation Perspective | 2013 | Nigeria | 206 |
| Al-Aan TV. 'أخبار الآن - أخبار العراق - شمال شرق العراق في ديارل حرب المياه في ديارل تنظيم داعش يشن حرب المياه في ديارل تنظيم داعش' ISIS Is Waging a Water War in Diyala, Northeastern Iraq' | 2014 | Iraq | N.a. |
| Al-Muqdadi, Sameh W., Mohammed F. Omer, Rudy Abo, and Alice Naghshineh. 'Dispute over Water Resource Management—Iraq and Turkey' | 2016 | Iraq, Turkey | 13 |
| Amnesty International USA. 'Un-Natural Disaster: Human Rights in the Gulf Coast' | 2010 | Gulf Coast | N.a. |
| Arctic Monitoring and Assessment Programme. 'Adaptation Actions for a Changing Arctic: Perspectives from the Barents Area | 2017 | Europe, Asia (Barents region) | N.a. |
| Asaka, Jeremiah O. 'Climate Change - Terrorism Nexus? A Preliminary Review/ Analysis of the Literature' | 2021 | No specific regions covered | 2 |
| Baalen, Sebastian van, and Malin Mobjörk. 'A Coming Anarchy? Pathways from Climate Change to Violent Conflict in East Africa' | 2016 | East Africa | 8 |
| Bayrak & Marafa. Ten years of REDD+: A critical review of the impact of REDD+ on forest-dependent communities | 2016 | No specific regions covered | 103 |
| Bellemare, Marc F. 'Rising Food Prices, Food Price Volatility, and Social Unrest' | 2015 | No specific regions covered | 546 |
| Bello-Schunemann, Julia, and Jonathan Moyer. 'Structural Pressures and Political Instability: Trajectories for Sub-Saharan Africa | 2018 | Sub-Saharan Africa | 15 |
| Benjaminsen, Tor A., Koffi Alinon, Halvard Buhaug, and Jill Tove Buseth. 'Does Climate Change Drive Land-Use Conflicts in the Sahel? | 2012 | Sahel Africa | 247 |
| Bernauer, Thomas, and Tobias Siegfried. 'Climate Change and International Water Conflict in Central Asia' | 2012 | Central Asia | 211 |
| Berrebi, Claude, and Jordan Ostwald. 'Earthquakes, Hurricanes, and Terrorism: Do Natural Disasters Incite Terror?' | 2011 | No specific regions covered | 114 |
| Black, Richard, W. Neil Adger, Nigel W. Arnell, Stefan Dercon, Andrew Geddes, and David Thomas. 'The Effect of Environmental Change on Human Migration' | 2011 | No specific regions covered | 968 |
| Brochmann, Marit, and Nils Petter Gleditsch. 'Shared Rivers and Conflict – A Reconsideration' | 2012 | No specific regions covered | 115 |
| Brzoska, Michael, and Christiane Fröhlich. 'Climate Change, Migration and Violent Conflict: Vulnerabilities, Pathways and Adaptation Strategies' | 2016 | No specific regions covered | 175 |
| Buhaug, Halvard. 'Climate Change and Conflict: Taking Stock' | 2016 | No specific regions covered | 68 |
| Buhaug, Halvard. Climate–Conflict Research: Some Reflections on the Way Forward' | 2015 | No specific regions covered | 142 |
| Buhaug, Halvard, Tor A. Benjaminsen, Espen Sjaastad, and Ole Magnus Theisen. 'Climate Variability, Food Production Shocks, and Violent Conflict in Sub-Saharan Africa' | 2015 | Sub-Saharan Africa | 127 |
| Bullard, Robert D. Confronting Environmental Racism: Voices from the Grassroots | 1993 | United States | 1643 |
| Bunte, Jonas B, and Laura Thaut Vinson. 'Local Power-Sharing Institutions and Interreligious Violence in Nigeria' | 2016 | Nigeria | 34 |
| Bureau for Crisis Prevention and Recovery. 'Disaster-Conflict Interfaces: Comparative Experiences'. United Nations Development Programme | 2011 | No specific regions covered | N.a. |
| Campbell, Ivan. 'Climate Change and Conflict: Lessons from Community Conservancies in Northern Kenya' | 2009 | Kenya | 44 |

| Articles | Time period | Geographic spread | Number of citations/ relevance |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------------------------|-----------------------------------|
| Castells-Quintana, David, and Thomas K.J. McDermott†. 'Climate, Urbanisation and Conflict: The Effects of Weather Shocks and Floods on Urban Social Disorder' | 2019 | No specific regions covered | 1 |
| Caus, Jessica. 'Climate-Driven Recruitment into Armed Groups in Nigeria'. MEAC Findings | 2021 | Nigeria | N.a. |
| Cederman, Lars-Erik, and Nils B. Weidmann. 'Predicting Armed Conflict: Time to Adjust Our Expectations?' | 2017 | No specific regions covered | 124 |
| Cederman, Lars-Erik, Andreas Wimmer, and Brian Min. 'Why Do Ethnic Groups Rebel? New Data and Analysis' | 2010 | No specific regions covered | 1405 |
| Chadefaux, Thomas. 'Conflict Forecasting and Its Limits'. Data Science 1, no. 1–2 (2017) | 2017 | No specific regions covered | 28 |
| Chavunduka, Charles, and Daniel W. Bromley. 'Climate, Carbon, Civil War and Flexible Boundaries: Sudan's Contested Landscape' | 2011 | Sudan | 26 |
| UN News. 'Climate Change Recognized as "Threat Multiplier", UN Security Council Debates Its Impact on Peace' | 2019 | No specific regions covered | N.a. |
| Collier, Paul, Gordon Conway, and Tony Venables. 'Climate Change and Africa' | 2008 | Africa | 585 |
| Cuny, Frederick C. Disasters and Development | 1994 | No specific countries covered | 1043 |
| Davenport, Christian. 'State Repression and Political Order' | 2007 | No specific countries covered | 1389 |
| De Juan, Alexander. 'Long-Term Environmental Change and Geographical Patterns of Violence in Darfur, 2003–2005' | 2015 | Sudan | 91 |
| De Mesquita, Bruce Bueno, and Alastair Smith. 'Leader Survival, Revolutions, and the Nature of Government Finance' | 2010 | No specific regions covered | 497 |
| Detges, Adrien. 'Local Conditions of Drought-Related Violence in Sub-Saharan Africa: The Role of Road and Water Infrastructures' | 2016 | Sub-Saharan Africa | 59 |
| Devlin, Colleen, and Cullen S. Hendrix. 'Trends and Triggers Redux: Climate Change, Rainfall, and Interstate Conflict' | 2014 | No specific regions covered | 63 |
| Drury, A. Cooper, and Richard Stuart Olson. 'Disasters and Political Unrest: An Empirical Investigation'. | 1998 | No specific regions covered | 234 |
| Eastin, Joshua. 'Hell and High Water: Precipitation Shocks and Conflict Violence in the Philippines' | 2018 | Philippines | 27 |
| Eklow, Karolina, and Florian Krampe. 'Climate-Related Security Risks and Peacebuilding in Somalia' | 2019 | Somalia | 7 |
| Elhance, Arun P. Hydropolitics in the Third World: Conflict and Cooperation in International River Basins. | 1999 | No specific regions covered | 510 |
| Fjelde, Hanne, and Nina von Uexkull. 'Climate Triggers: Rainfall Anomalies, Vulnerability and Communal Conflict in Sub-Saharan Africa' | 2012 | Sub-Saharan Africa | 284 |
| Franco, Jennifer, Clara Mi Young Park, and Roman Herre. 'Just Standards: International Regulatory Instruments and Social Justice in Complex Resource Conflicts' | 2017 | Cambodia and Myanmar | 17 |
| Gaikwad, Nikhar, and Gareth Nellis. 'The Majority-Minority Divide in Attitudes toward Internal Migration: Evidence from Mumbai' | 2017 | India | 47 |
| Gawronski, Vincent T., and Richard Stuart Olson. 'Disasters as Crisis Triggers for Critical Junctures? The 1976 Guatemala Case' | 2013 | Guatemala | 36 |
| Ghimire, Ramesh, and Susana Ferreira. 'Floods and Armed Conflict'. Environment and Development Economics | 2016 | No specific regions covered | 25 |
| Gizelis, Theodora-Ismene, Steve Pickering, and Henrik Urdal. 'Conflict on the Urban Fringe: Urbanization, Environmental Stress, and Urban Unrest in Africa' | 2021 | Africa | N.a. |
| Gleditsch, Nils Petter, Kathryn Furlong, Håvard Hegre, Bethany Lacina, and Taylor Owen. 'Conflicts over Shared Rivers: Resource Scarcity or Fuzzy Boundaries?' | 2006 | No specific regions covered | 400 |
| Goering, Laurie. 'As Climate Threats Grow, Iraq Battles a New Enemy: Water Shortages' | 2017 | Iraq | N.a. |

| Articles | Time period | Geographic spread | Number of citations/ relevance |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|---------------------------------------------|-----------------------------------|
| Guha, Ramachandra, and Joan Martínez Alier. <i>Varieties of Environmentalism: Essays North and South</i> | 2013 | North & South America, Asia, Europe | 1563 |
| Guiu, Roger. 'When Canals Run Dry, Displacement Triggered by Water Stress in the South of Iraq'. <i>No Matter of Choice: Displacement in a Changing Climate</i> | 2020 | Iraq | |
| Halvard Buhaug. 'Global Security Challenges of Climate'. | 2018 | No specific regions covered | 2 |
| Hassan, Kawa, Camilla Born, and Pernilla Nordqvist. 'Iraq: Climate-Related Security Risk Assessment'. | 2018 | Iraq | N.a. |
| Hendrix, Cullen, and Henk-Jan Brinkman. 'Food Insecurity and Conflict Dynamics: Causal Linkages and Complex Feedbacks'. | 2013 | Sahel Africa | 192 |
| Hoermann, B., Soumyadeep Banerjee, and M. Kollmair. 'Labour Migration for Development in the Western Hindu Kush-Himalayas: Understanding a Livelihood Strategy in the Context of Socioeconomic and Environmental Change.' | 2010 | Afghanistan | 36 |
| TF Homer-Dixon. 'On the Threshold: Environmental Changes as Causes of Acute Conflict'. | 1991 | No specific regions covered | 2015 |
| Hunsberger, Carol, Esteve Corbera, Saturnino M. Borrás, Jennifer C. Franco, Kevin Woods, Courtney Work, Romulo de la Rosa, et al. 'Climate Change Mitigation, Land Grabbing and Conflict: Towards a Landscape-Based and Collaborative Action Research Agenda'. | 2017 | No specific regions covered | 78 |
| Ide, Tobias, Michael Link, Jürgen Scheffran, and Janpeter Schilling. 'The Climate-Conflict Nexus: Pathways, Regional Links and Case Studies'. | 2016 | Kenya, the Nile Basin, and Israel/Palestine | 24 |
| International Alert. 'If Victims Become Perpetrators: Factors Contributing to Vulnerability and Resilience to Violent Extremism in the Central Sahel'. | 2018 | Sahel Africa | N.a. |
| International Crisis Group. 'Violence in Nigeria's North West: Rolling Back the Mayhem' | 2020 | Nigeria | N.a. |
| Kahn, Matthew E. 'The Death Toll from Natural Disasters: The Role of Income, Geography, and Institutions'. | 2005 | No specific regions covered | 1419 |
| Kalin, Walter. 'Conceptualising Climate-Induced Displacement'. | 2010 | No specific regions covered | 123 |
| Kelley, Colin P., Shahrzad Mohtadi, Mark A. Cane, Richard Seager, and Yochanan Kushnir. 'Climate Change in the Fertile Crescent and Implications of the Recent Syrian Drought'. | 2015 | Syria | 1301 |
| King, Marcus DuBois. 'The Weaponization of Water in Syria and Iraq'. | 2015 | Syria, Iraq | 69 |
| Koren, Ore, Benjamin E Bagozzi, and Thomas S Benson. 'Food and Water Insecurity as Causes of Social Unrest: Evidence from Geolocated Twitter Data'. | 2021 | Kenya | 8 |
| Koubi, Vally. 'Climate Change and Conflict'. | 2019 | No specific regions covered | 99 |
| Kuzma, Samantha, Peter Kerins, Elizabeth Saccoccia, Cayla Whiteside, Hannes Roos, and Charles Iceland. 'Leveraging Water Data In A Machine Learning-Based Model For Forecasting Violent Conflict'. | 2020 | No specific regions covered | 2 |
| Lawson, Fred H. 'Egypt versus Ethiopia: The Conflict over the Nile Metastasizes'. | 2017 | Egypt, Ethiopia | 21 |
| Leff, Jonah. 'Pastoralists at War: Violence and Security in the Kenya-Sudan-Uganda Border Region'. | 2009 | Kenya, Sudan, Uganda | 116 |
| Linke, Andrew M., John O'Loughlin, J. Terrence McCabe, Jaroslav Tir, and Frank D. W. Witmer. 'Rainfall Variability and Violence in Rural Kenya: Investigating the Effects of Drought and the Role of Local Institutions with Survey Data'. | 2015 | Kenya | 57 |
| Mares, Dennis M., and Kenneth W. Moffett. 'Climate Change and Interpersonal Violence: A "Global" Estimate and Regional Inequities'. | 2016 | No specific regions covered | 61 |
| Math Vault. 'The Definitive Glossary of Higher Math Jargon'. | 2019 | No specific regions covered | N.a. |
| McDonald, Matt. 'Discourses of Climate Security'. | 2013 | No specific regions covered | 210 |

| Articles | Time period | Geographic spread | Number of citations/ relevance |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-----------------------------|-----------------------------------|
| McGuirk, Eoin, and Nathan Nunn. 'Transhuman Pastoralism, Climate Change, and Conflict in Africa'. | 2020 | Africa | 15 |
| Meier, Patrick, Doug Bond, and Joe Bond. 'Environmental Influences on Pastoral Conflict in the Horn of Africa'. | 2007 | Horn of Africa | 272 |
| Metzger, Pamela R. 'Doing Katrina Time Hurricane Katrina Symposium: Reshaping the Legal Landscape of the Gulf South: Criminal Law'. | 2006 | United States, Mexico | N.a. |
| Mosello, Beatrice, Lukas Rüttinger, and Liesa Sauerhammer. 'The Climate Change-Conflict Connection: The Current State of Knowledge'. | 2019 | No specific regions covered | N.a. |
| Mwaûra, Cirû, and Susanne Schmeidl. Early Warning and Conflict Management in the Horn of Africa | 2002 | Horn of Africa | 55 |
| Nel, Philip, and Marjolein Righarts. 'Natural Disasters and the Risk of Violent Civil Conflict'. | 2008 | No specific regions covered | 452 |
| NUPRI, and SIPRI. 'Climate, Peace and Security Fact Sheet South Sudan'. | 2021 | South Sudan | N.a. |
| OECD. 'Methodology for Exploring Fragility and Projecting Progress'. | 2015 | No specific regions covered | N.a. |
| Oxford Dictionary. 'Meaning of Pathology in English'. | 2021 | No specific regions covered | N.a. |
| Pacific Institute. 'Water Conflict Chronology Timeline List'. | 2021 | No specific regions covered | N.a. |
| Pelling, Mark, and Kathleen Dill. 'Disaster Politics: Tipping Points for Change in the Adaptation of Sociopolitical Regimes'. | 2010 | Turkey | 462 |
| Peters, Kate, Mairi Dupar, Sarah Opitz-Stapleton, Emma Lovell, Mirianna Budimir, Sarah Brown, and Yue Cao. 'Climate Change, Conflict and Fragility: An Evidence Review and Recommendations for Research and Action'. | 2020 | No specific regions covered | 11 |
| Price, Gregory N., and Juliet U. Elu. 'Climate Change and Cross-State Islamist Terrorism in Nigeria'. | 2017 | Nigeria | 9 |
| Raineri, Luca. 'Sahel Climate Conflicts? When (Fighting) Climate Change Fuels Terrorism'. | 2020 | Sahel Africa | 5 |
| Raleigh, Clionadh. 'Political Marginalization, Climate Change, and Conflict in African Sahel States'. | 2010 | Sahel Africa | 267 |
| Raleigh, Clionadh, Hyun Jin Choi, and Dominic Kniveton. 'The Devil Is in the Details: An Investigation of the Relationships between Conflict, Food Price and Climate across Africa'. | 2015 | Africa | 136 |
| Raleigh, Clionadh, and Dominic Kniveton. 'Come Rain or Shine: An Analysis of Conflict and Climate Variability in East Africa'. | 2012 | East Africa | 290 |
| Remmits, Femke, Elisabeth Dick, and Michel Rademaker. 'Climate Security Assessment: A Methodology and Assessment of the Nexus between Climate Hazards and Security of Nations and Regions'. | 2020 | No specific regions covered | N.a. |
| Reuters. 'France's Macron Says Real "ecocide" Going on in Amazon'. | 2019 | No specific regions covered | N.a. |
| Reuveny, Rafael. 'Climate Change-Induced Migration and Violent Conflict'. | 2007 | No specific regions covered | 1175 |
| Rezaeedyakenari, Babak, Steven T. Landis, and Cameron G. Thies. 'Food Price Volatilities and Civilian Victimization in Africa'. | 2020 | Africa | 8 |
| Rønnfeldt, Carsten F. 'Three Generations of Environment and Security Research'. | 1997 | No specific regions covered | 153 |
| Rudolfson, Ida. 'Food Price Increase and Urban Unrest: The Role of Societal Organizations'. | 2020 | No specific regions covered | 5 |
| Rüttinger, Lukas. 'Insurgency, Terrorism and Organised Crime in a Warming Climate Climate-Diplomacy'. | 2017 | No specific regions covered | 55 |
| Rüttinger, Lukas, Dan Smith, Gerald Stang, Dennis Tänzler, and Janani Vivekananda. 'A New Climate for Peace: Taking Action on Climate and Fragility Risks'. | 2015 | No specific regions covered | N.a. |

| Articles | Time period | Geographic spread | Number of citations/ relevance |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|----------------------------------|-----------------------------------|
| Saadoun, Mustafa. 'Tribal Disputes Flare in Southern Iraq over Water Scarcity'. | 2018 | Iraq | N.a. |
| Salehyan, Idean. 'Climate Change and Conflict: Making Sense of Disparate Findings'. | 2014 | No specific regions covered | 128 |
| Sam-Aggrey, Horatio, and Marc Lanteigne. 'Environmental Security in the Arctic: Shades of Grey?'. | 2020 | Arctic | 3 |
| SIPRI, Mobjörk, Malin, Florian Krampe, and Tarif, Kheira. 'Pathways of Climate Insecurity: Guidance for Policymakers'. | 2014 | No specific regions covered | N.a. |
| Smith, Todd Graham. 'Feeding Unrest: Disentangling the Causal Relationship between Food Price Shocks and Sociopolitical Conflict in Urban Africa'. | 2014 | Africa | 130 |
| Spadaro, Paola Andrea. 'Climate Change, Environmental Terrorism, Eco-Terrorism and Emerging Threats'. | 2020 | No specific regions covered | 4 |
| The Alan Turing Institute. 'Global Urban Analytics for Resilient Defence'. | 2021 | No specific regions covered | N.a. |
| The CNA Military Advisory Board. 'National Security and the Threat of Climate Change'. | 2007 | United States | 121 |
| Thomas F. Homer-Dixon. Environment, Scarcity, and Violence. | 1999 | Mexico, Asia, Sub-Saharan Africa | N.a. |
| Uexkull, Nina von, and Halvard Buhaug. 'Security Implications of Climate Change: A Decade of Scientific Progress'. | 2021 | No specific regions covered | 21 |
| Uexkull, Nina von, Mihai Croicu, Hanne Fjelde, and Halvard Buhaug. 'Civil Conflict Sensitivity to Growing-Season Drought'. | 2016 | Asia and Africa | 241 |
| United Nations Security Council. 'Maintenance of International Peace and Security: Climate Security'. | 2020 | No specific regions covered | N.a. |
| van Baalen, Sebastian, and Mobjörk, Malin. 'A Coming Anarchy? Pathways from Climate Change to Violent Conflict in East Africa'. | 2016 | East Africa | 8 |
| Vesco, Paola, Shouro Dasgupta, Enrica De Cian, and Carlo Carraro. 'Natural Resources and Conflict: A Meta-Analysis of the Empirical Literature'. | 2020 | No specific regions covered | 19 |
| Ward, Michael D. 'Can We Predict Politics? Toward What End?'. | 2016 | No specific regions covered | 36 |
| Witsenburg, K. M., and A. W. Roba. 'Surviving Pastoral Decline: Pastoral Sedentarisation, Natural Resource Management and Livelihood Diversification in Marsabit District, Northern Kenya Deel: Vol. I'. | 2004 | Kenya | 35 |
| Wood, Reed M., and Thorin M. Wright. 'Responding to Catastrophe: Repression Dynamics Following Rapid-Onset Natural Disasters'. | 2016 | No specific regions covered | 48 |
| Work, Courtney, and Ratha Thuon. 'Inside and Outside the Maps: Mutual Accommodation and Forest Destruction in Cambodia'. | 2017 | Cambodia | 17 |
| Wright, Joseph. 'To Invest or Insure?: How Authoritarian Time Horizons Impact Foreign Aid Effectiveness'. | 2008 | No specific regions covered | 199 |
| Yoffe, Shim, Aaron T. Wolf, and Mark Giordano. 'Conflict and Cooperation Over International Freshwater Resources: Indicators of Basins at Risk'. | 2007 | No specific regions covered | 155 |

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- Atkin, Emily. 'Climate Change Is Aggravating the Suffering in Yemen'. *The New Republic*, 2018. <https://newrepublic.com/article/152011/climate-change-aggravating-suffering-yemen>.
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The Hague Centre
for Strategic Studies

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Lange Voorhout 1
2514 EA Hague

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Email: info@hcss.nl

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