Climate Security: How to Write About the Future Without Lapsing into Prophecy

Joshua W. Busby, *LBJ School of Public Affairs, University of Texas at Austin, USA*

A robust literature on climate change and security developed in the 2010s. Much of the literature attempts to chart how climate change could contribute directly or indirectly to conflict and instability through impacts on agriculture, migration, and disasters (Busby 2018; Koubi 2019; Theisen 2017).[1] The methodological challenge is that climate change is an emergent problem, wherein the security consequences largely have yet to occur. However, the field's methods and expertise are primarily explanatory of past patterns. For scholars who want to make claims about future security risks, Gledistch (1998, 394) warned of potentially slipping into prophecy. If scholars want to write about climate change and retain academic rigor, what are they to do? This article reviews the challenges for scholars in this space and identifies potential research strategies that might be pursued going forward.

THE END OF STATIONARITY–THE FUTURE IS DIFFERENT

Jay Gulledge and I argued previously that we are facing what scientists call the end to "stationarity" (Busby et al. 2012, 7–8). The current geologic age, the Holocene—which began 12,000 years ago—has been characterized by "stationarity," or relatively stable global climatic patterns. That relative stability allowed human civilizations to evolve from nomadic lives to settled agriculture to more contemporary forms of urban living—made possible by relatively predictable environmental conditions and human ingenuity that generated sufficient food and energy to support those city dwellers (Milly 2008; Milly et al. 2015). Scholars who examine the near-term historical record—which is most similar to the present in terms of social systems—will apply their insights to a world that will differ quite dramatically in terms of the magnitude, frequency, and geography of the physical effects of climate change.

The climate security field and the social sciences, however, are skeptical about scholarship that makes broad claims about future security risks. Gleditsch (1998, 394) trenchantly wrote: "'There will be water wars in the future' is no more a testable statement than the proverbial 'The end of the world is at hand,' unless terms such as 'the future' and 'at hand' are clearly specified."

Given these concerns, the climate security field, as Werrell and Femia (2019) noted, "favors forensic analysis—case studies or information on past events, rather than future scenarios that social science methods cannot reliably test." Social scientists generally look to the past to understand the implications for the future. Many use historic evidence of droughts, temperature change, rainfall volatility, and other physical phenomena as proxies for future climate change to assess whether they historically contributed to negative security outcomes such as armed conflict. In keeping with normal scientific practice, scholars (myself included) have examined how states responded in the recent past to climate-related extreme weather (Busby 2022). These extreme weather events are consistent with what we expect from anthropogenic climate change, but they may not be attributable to climate change.

These proxies for climate change mostly correspond to short-run shocks or deviations in rainfall or temperature. However, this emphasis on the short run is different from long-run changes that we associate with climate change (Theisen 2017; von Uexkull and Buhaug 2021). These changes will unfold over decades and shape the baseline conditions for agriculture, economic development, and even the habitability of societies. We have only begun to experience these effects. Rather than a one-off storm or even a multi-month drought, we are discussing changes in long-term means for rainfall and temperature as well as the tails of observed extreme weather (Intergovernmental Panel on Climate Change 2001;Wagner and Weitzman 2015).

Future climate change may deviate in terms of temperature and rainfall from the normal bounds of what people have been accustomed to for thousands of years. The geography of places affected by weather extremes also may be significantly different from past patterns. Parts of the world may become uninhabitable or barely habitable without major adaptation efforts (Im, Pal, and Eltahir 2017; Wallace-Wells 2019; Xu et al. 2020).

DEEP HISTORICAL ANALYSIS

What, then, are potential responses by scholars to this conundrum? Some have mined the deep historical record to see how human societies hundreds or thousands of years ago dealt with such cataclysmic changes in climatic conditions. Diamond

doi:10.1017/S104909652300032X

(2004) studied the way that preindustrial societies such as the Greenland Norse, populations on Easter Island, the Anasazi, and the Maya all faced collapse from environmental damage. In their quantitative meta-analysis of the influence of climate on human conflict, Hsiang, Burke, and Miguel (2013) included numerous examples from the distant past and the impact of climate changes on various civilizations, including the collapse of the Maya, the Angkor kingdom in modern-day Cambodia, and the Akkadian empire in ancient Mesopotamia—as well as changes in dynastic transitions in China, abandonment of the Lake Titicaca region in modern-day Peru, and political instability in Europe (Hsiang, Burke, and Miguel 2013).

These historical episodes are important and interesting in their own right. However, differences in adaptive capacity, technological options, and trade and humanitarian networks, as well as changes in social systems, limit their transferability to contemporary situations, barring an explicit effort to surface these differences. While horrendous outcomes are still possible in the wake of extreme weather events and even long-run changes in climatic conditions—particularly in poorly governed places on the planet—it is not clear which lessons we should draw from the premodern era. There remains a role for using historical analogies to elucidate possible future security impacts, but scholars must be more careful and critical in their case selection when they surface analogies from the distant past (Tubi et al. 2022).

SCENARIOS AND PROJECTIONS

Another alternative is scenario analysis. There are different types, some of which are more accepted in social science.[2] Scenarios often have been used by the business community and policy makers to envision possible futures and surface the assumptions that might lead to different outcomes (Task Force on Climate-Related Disclosures ND). These scenarios can be either qualitative, with different descriptions of possible future worlds, or quantitative.

For qualitative scenarios, several future worlds are depicted, often ranging from a worst case, in which countries or actors do not work together, to those involving a more collaborative outcome. In between are mixed scenarios in which some factors favor good outcomes while others do not. For example, the National Intelligence Council (2021) published the 2040 Global Trends report with five scenarios along these lines with climate change as a common stressor. An early scenario-driven report in the climate security space was published by Schwartz and Randall (2004), purportedly commissioned by the US Department of Defense. They depicted a fanciful scenario of abrupt climate change that led to global cooling that prompted outmigration from the United States to Mexico. In a 2020 report, the Center for Climate and Security used a near-term warming scenario of 1 to 2 degrees C for the period up to 2050 and a medium-term warming scenario of 2 to 4 degrees C for 2050–2100. Security practitioners then assessed the impacts on security in different regions (Guy 2020). Although qualitative scenarios are popular in the grey literature and the policy/business world, they may have limited academic credibility. They are not designed to be preferred end states and neither are they intended to be falsifiable or even true. Rather, the question is whether they are useful for prodding decision makers from their inertia to consider alternative futures that could prove costly for their organization's interests (Wilkinson and Kupers 2013).

Other scenarios are more formal and quantitative. The Intergovernmental Panel on Climate Change (IPCC) uses different types of scenarios. In their 2014 fifth assessment report, it used so-called Representative Concentration Pathways (RCPs) to model different emissions trajectories for their future climate impacts. In their 2021 sixth assessment report, the IPCC used so-called Shared Socio-Economic Pathways (SSPs), which assume different levels of ambition on climate mitigation and adaptation and which can be used alongside Integrated Assessment Models to assess future climate impacts.[3]

These and similar scenarios have been used for climate-security–related work by social scientists. Most use an historical period to "train" the data to identify patterns and associations and then project forward based on a trajectory of climate change, emissions, economic growth, and/or other parameters. For example, a 2009 study by economists on climate change and civil wars in Africa projected the number of likely future civil wars and battle deaths by 2030 based on extrapolations of past conflict mortality and ensembles of climate model projections of future temperature and rainfall (Burke et al. 2009). In another study, Hegre et al. (2016) set aside connections between climate and conflict to model future conflict incidence based on the IPCC's SSP scenarios of future economic growth. Hoch et al. (2021) projected future conflict risks in Africa, using a combination of RCP emissions pathways and SSP socioeconomic pathways, training their data on 1990–2015 using machine-learning techniques and then projecting forward to the 2041–2050 period.[4]

A related approach by economists combined assessment of future mortality risks from a changing climate that accounted for adaptation capability through projections of future income (Carleton et al. 2022). They used available mortality data from 40 countries to estimate relationships between temperature and mortality, extrapolating to countries that lacked historic mortality data. For some studies, one problem—the previous study included—is the reliance on worst-case scenarios of climate change. For example, RCP 8.5, a frequently used worst-case scenario, may overstate the emissions trajectory that humanity currently is on that actually is more midrange like the RCP 4.5 scenario (Hausfather 2019).

Although these approaches are promising avenues for research, one limitation is that they depend on assumptions of stationarity—that is, stable relations between cause and effect across periods. In their provocatively titled paper, Bowlsby et al. (2020) noted that drivers of conflict in one period may not hold for different periods. For example, they found that drivers of political instability explained the 1995–2004 period well but did not explain instability associated with the subsequent Arab Spring. As the climate changes, this problem will become more acute (Bowlsby et al. 2020). As

https://doi.org/10.1017/S104909652300032X Published online by Cambridge University Press

Hoch et al. (2021, 10) noted, "Relations will most likely not remain stable over time; especially when climate change impacts worsen." For example, using historic data, the causal contribution of climate factors to conflict often is small compared to other factors, such as governance. As climate change worsens, that relationship likely will change (Hoch et al. 2021; Mach et al. 2019). Thus, if patterns and drivers are not robust across time, out-of-sample validation and efforts to predict future trends may be suspect, particularly as the climate changes.

Although experimentation with forecasting is worthwhile, available data may lead to an elusive quest for prediction that may struggle to accurately forecast future incidence of security problems. Given human agency and unforeseen causal factors, scholars should have some modesty about their models' forecasting precision.

EXPERT JUDGMENT

Some scenarios use expert judgment to assess regional climate security risks over time. Expert judgment has more established support in the academic literature.[5] For example, Brooks, Adger, and Kelly (2005) used expert judgment to validate which indicators to include in a composite index of climate vulnerability and which weights to assign to them. Busby et al. (2018) used a similar expert elicitation to conduct sensitivity tests for their composite index of likely South Asia and Southeast Asia climate security hot spots. Both projects were intended to identify relative vulnerabilities to future climate change.

Similarly, Mach et al. (2019) assessed the role of climate relative to other factors in the incidence of conflict. This approach asked a small number of experts to rank, weigh, and assess the uncertainty of key drivers of internal conflict. The experts suggested that low economic development and low state capability were the most important drivers of conflict with climate among the lowest of the 15 indicators. However, the respondents also indicated wide uncertainty about climate if magnitudes of climate change exceed previous experiences, given how climate trajectories are bound up with future socioeconomic trajectories.

Finally, another approach asked regional experts to write about what climate change would mean for the security of particular countries. In an edited volume by Moran (2011), area experts assessed the potential significance of climate change out to 2030 for 42 countries and regions.[6] Similar expert assessments may be idiosyncratic with varying levels of quality and depth of scientific understanding. They also may miss patterns across cases that are only visible through comparisons. However, scholars steeped in the history and geography of particular places may understand the implications of physical changes better than generalists.

CONCLUSIONS

In light of these observations, what are promising ways forward? First, for certain physical indicators of climate change (i.e., temperature change and sea-level rise), we can anticipate the choices that communities and decision makers will face with some precision, even if the social and political consequences are more uncertain. Most climate models show little divergence until 2050; thereafter, different emissions trajectories will show up in patterns of climate change.

Scientists have identified temperature and humidity thresholds amenable to human habitability: roughly a "wet bulb" temperature of 35°C or 95°F. We can anticipate widening zones where temperatures regularly will exceed these thresholds, making it increasingly difficult for people to live in certain regions and likely leading to some outmigration.[7] Similarly, it is possible to anticipate given coastal elevation levels and projected sea-level rise, where populations and critical infrastructure will become permanently or temporarily inundated due to sea-level rise and/or tidal movements.[8] In the short to medium run, it also may be possible to anticipate where there likely will be demographic change and migration that increase the size of populations living in climate-exposed areas (Wang, Meng, and Long 2022). The next step in this type of analysis would be to surface the likely sociopolitical implications of these impacts. For example, if several hundred thousand people in a specific area likely will find it too hot to live there by 2050: (1) how will they react, (2) where will they go, and (3) what would this movement mean for political dynamics?

Another strategy is to assess the predictive accuracy of early forecasting studies in this space such as the Burke et al. (2009) study, which forecast the increase in civil war incidence and battle deaths by 2030 in a warming world. As we get closer to 2030, it will be possible to compare these projections to what actually happened and assess their forecasting accuracy.

Although the impacts of climate security are largely prospective, the field's primary tools are geared toward explaining the past. I surveyed examples from three different approaches—deep historical analysis, scenarios, and expert judgment—all of which have their uses and limitations. Knowing how to credibly evaluate the future security risks of climate change in the academic literature likely will require additional methodological experimentation.

https://doi.org/10.1017/S104909652300032X Published online by Cambridge University Press

Decision makers must prioritize places of concern for attention and resources with imperfect information. Forecasting accuracy may be one parameter, but ease of use and intelligibility to non-specialists also are important. Some promising methods seek to identify climate security hot spots, some are based on emergent short-run changes in weather, and others are based more on long-term chronic risks. For example, Busby and von Uexkull (2018) took chronic risk factors for conflict (i.e., recent history of conflict, high dependence on agriculture, and high levels of political exclusion) along with an indicator of emerging water deficits to identify countries of concern for climate-related security crises. Whereas that approach focused on short-run early warning, Moran et al. (2018) in a US Agency for International Development project identified perennial places of concern by overlaying an index of state fragility on a composite index of historic climate-hazard exposure.[9] Although there is a rich peer-reviewed literature on hot spot mapping, neither of these studies was peer reviewed. Like the Burke et al. (2009) study, these also could be subject to retrospective and out-of-sample validation to determine whether the identified risk factors and places of concern corresponded to actual places that experienced problems. In addition to overall model fidelity, this research could assess outliers, including surprise hot spots or places of unexpected stability.

We also must recognize that projections and hot-spot maps of places of concern are not destiny. Human agency has the capacity to ameliorate if not completely eliminate these risks; it also has the potential to make situations worse, which raises another issue. The ways that we respond to climate impacts, through adaptation and mitigation, could become sources of conflict that are not yet captured in climate security studies. However, scholars are recognizing the potential through case studies of the "backdraft" potential of the search for arable land, minerals to power the clean-energy economy, geoengineering, and other policy responses to climate change (Dabelko et al. 2013). Incorporating the impacts of these efforts into research is challenging but necessary.

This article assesses examples of the ways that social scientists have sought to understand the future security implications of climate change. Although the impacts of climate security are largely prospective, the field's primary tools are geared toward explaining the past. I surveyed examples from three different approaches—deep historical analysis, scenarios, and expert judgment—all of which have their uses and limitations. Knowing how to credibly evaluate the future security risks of climate change in the academic literature likely will require additional methodological experimentation.

ACKNOWLEDGMENTS

This article benefited from helpful feedback from the reviewers and editors as well as from conversations with Andrew Linke and Tom Parris. I thank Ayesha Siddiqi and fellow panelists for their comments at the International Studies Association.

CONFLICTS OF INTEREST

The author declares that there are no ethical issues or conflicts of interest in this research. ■

NOTES

1. For a more expansive discussion of climate impacts on other security outcomes such as humanitarian emergencies, see Busby (2022, chap. 2).
2. For a sophisticated exploration in the climate security and disasters space, see Briggs and Matejova (2019).
3. See https://climatedata.ca/resource/understanding-shared-socio-economic-pathways-ssps.
4. Two other climate security forecasting projects examine Africa and Kenya (Linke, Witmer, and O'Loughlin 2022; Witmer et al. 2017).
5. Other projects aim to make use of expert views for prediction purposes, such as the Good Judgment Project. See https://goodjudgment.com.
6. For a water-security edited volume, see Reed (2017).
7. See, for example, this project at www.weatheringrisk.org/en.
8. See, for example, this mapping project at https://sealevel.climatecentral.org.
9. For a hybrid between short- and long-run early warnings, see https://climate-conflict.org.

REFERENCES

Bowlsby, Drew, Erica Chenoweth, Cullen Hendrix, and Jonathan D. Moyer. 2020. "The Future Is a Moving Target: Predicting Political Instability." *British Journal of Political Science* 50 (4): 1405–17. https://doi.org/10.1017/S0007123418000443.

Briggs, Chad M., and Miriam Matejova. 2019. *Disaster Security*. Cambridge, UK: Cambridge University Press. https://doi.org/10.1017/9781108560023.

Brooks, Nick, W. Neil Adger, and P. Mick Kelly. 2005. "The Determinants of Vulnerability and Adaptive Capacity at the National Level and the Implications for Adaptation." *Global Environmental Change* 15 (2): 151–63.

Burke, Marshall B., Edward Miguel, Shanker Satyanath, John A. Dykema, and David B. Lobell. 2009. "Warming Increases the Risk of Civil War in Africa." *Proceedings of the National Academy of Sciences* 106 (49): 20670–74. https://doi.org/10.1073/pnas.0907998106.

Busby, Joshua, Todd G. Smith, Nisha Krishnan, Charles Wight, and Santiago Vallejo-Gutierrez. 2018. "In Harm's Way: Climate Security Vulnerability in Asia." *World Development* 112 (December): 88–118. https://doi.org/10.1016/j.worlddev.2018.07.007.

Busby, Joshua, and Nina von Uexkull. 2018. "Climate Shocks and Humanitarian Crises." *Foreign Affairs*, November 29. www.foreignaffairs.com/articles/world/2018-11-29/climate-shocks-and-humanitarian-crises.

Busby, Joshua W. 2018. "Taking Stock: The Field of Climate and Security." *Current Climate Change Reports* 4 (4): 338–46. https://doi.org/10.1007/s40641-018-0116-z.

Busby, Joshua W. 2022. *States and Nature: The Effects of Climate Change on Security. The Politics of Climate Change*. Cambridge, UK: Cambridge University Press. https://doi.org/10.1017/97811089579 22.

Busby, Joshua W., Jay Gulledge, Todd G. Smith, and Kaiba White. 2012. "Of Climate Change and Crystal Balls: The Future Consequences of Climate Change in Africa." *Air & Space Power Journal–Africa and Francophonie* 3:4–44.

Carleton, Tamma, Amir Jina, Michael Delgado, Michael Greenstone, Trevor Houser, Solomon Hsiang, Andrew Hultgren, et al. 2022. "Valuing the Global Mortality Consequences of Climate Change Accounting for Adaptation Costs and Benefits." *Quarterly Journal of Economics* 137 (4): 2037–105. https://doi.org/10.1093/qje/qjac020.

Dabelko, Geoffrey D., Lauren Herzer Risi, Schuyler Null, Meaghan Parker, and Russell Sticklor. 2013. "Backdraft: The Conflict Potential of Climate-Change Adaptation and Mitigation." www.wilsoncenter.org/publication/backdraft-the-conflict-potential-climate-change-adaptation-and-mitigation#sthash.k8mQTIYp.dpuf.

Diamond, Jared. 2004. *Collapse: How Societies Choose to Succeed or Fail*. New York: Viking Press.

Gleditsch, Nils Petter. 1998. "Armed Conflict and the Environment: A Critique of the Literature." *Journal of Peace Research* 35 (3): 381–400.

https://doi.org/10.1017/S104909652300032X Published online by Cambridge University Press

Guy, Kate. 2020. "A Security Threat Assessment of Global Climate Change: How Likely Warming Scenarios Indicate a Catastrophic Security Future." Washington, DC: The Center for Climate and Security. https://climateandsecurity.org/wp-content/uploads/2020/03/a-security-threat-assessment-of-climate-change.pdf.

Hausfather, Zeke. 2019. "Explainer: The High-Emissions 'RCP8.5' Global Warming Scenario." *Carbon Brief*, August 21. www.carbonbrief.org/explainer-the-high-emissions-rcp8-5-global-warming-scenario.

Hegre, Håvard, Halvard Buhaug, Katherine V. Calvin, Jonas Nordkvelle, Stephanie T. Waldhoff, and Elisabeth Gilmore. 2016. "Forecasting Civil Conflict along the Shared Socioeconomic Pathways." *Environmental Research Letters* 11 (5): 054002. https://doi.org/10.1088/1748-9326/11/5/054002.

Hoch, Jannis M., Sophie P. de Bruin, Halvard Buhaug, Nina von Uexkull, Rens van Beek, and Niko Wanders. 2021. "Projecting Armed-Conflict Risk in Africa Towards 2050 along the SSP–RCP Scenarios: A Machine-Learning Approach." *Environmental Research Letters* 16 (12): 124068. https://doi.org/10.1088/1748-9326/ac3db2.

Hsiang, Solomon M., Marshall Burke, and Edward Miguel. 2013. "Quantifying the Influence of Climate on Human Conflict." *Science* (August):1237557. https://doi.org/10.1126/science.1235367.

Im, Eun-Soon, Jeremy S. Pal, and Elfatih A. B. Eltahir. 2017. "Deadly Heat Waves Projected in the Densely Populated Agricultural Regions of South Asia." *Science Advances* 3 (8): e1603322. https://doi.org/10.1126/sciadv.1603322.

Intergovernmental Panel on Climate Change. 2001. "Climate Change 2001: The Scientific Basis." https://archive.ipcc.ch/ipccreports/tar/wg1/fig2-32.htm.

Koubi, Vally. 2019. "Climate Change and Conflict." *Annual Review of Political Science* 22 (1): 343–60. https://doi.org/10.1146/annurev-polisci-050317-070830.

Linke, Andrew M., Frank D. W. Witmer, and John O'Loughlin. 2022. "Weather Variability and Conflict Forecasts: Dynamic Human-Environment Interactions in Kenya." *Political Geography* 92 (January): 102489. https://doi.org/10.1016/j.polgeo.2021.102489.

Mach, Katharine J., Caroline M. Kraan, W. Neil Adger, Halvard Buhaug, Marshall Burke, James D. Fearon, Christopher B. Field, et al. 2019. "Climate as a Risk Factor for Armed Conflict." *Nature* 571 (7764): 193–97. https://doi.org/10.1038/s41586-019-1300-6.

Milly, Paul C. D. 2008. "Stationarity Is Dead: Whither Water Management?" *Science* 319:573–74.

Milly, Paul C. D., Julio Betancourt, Malin Falkenmark, Robert M. Hirsch, Zbigniew W. Kundzewicz, Dennis P. Lettenmaier, Ronald J. Stouffer, Michael D. Dettinger, and Valentina Krysanova. 2015. "On Critiques of 'Stationarity Is Dead: Whither Water Management?'" *Water Resources Research* 51 (9): 7785–89. https://doi.org/10.1002/2015WR017408.

Moran, Ashley, Joshua Busby, Clionadh Raleigh, Todd Smith, Roudabeh Kishi, Nisha Krishnan, and Charles Wight. 2018. "*Intersection of Global Fragility and Climate Risks.*" Washington, DC: US Agency for International Development.

Moran, Daniel (ed.). 2011. *Climate Change and National Security: A Country-Level Analysis.* Washington, DC: Georgetown University Press.

National Intelligence Council. 2021. "Global Trends 2040: A More Contested World." www.dni.gov/files/ODNI/documents/assessments/GlobalTrends_2040.pdf.

Reed, David (ed.). 2017. *Water, Security and U.S. Foreign Policy*. First edition. Oxfordshire, UK: Routledge.

Schwartz, Peter, and Doug Randall. 2004. "An Abrupt Climate Change Scenario and Its Implications for United States National Security." https://training.fema.gov/hiedu/docs/crr/catastrophe%20readiness%20and%20response%20-%20appendix%202%20-%20abrupt%20climate%20change.pdf

Task Force on Climate-Related Disclosures. ND. "The Use of Scenario Analysis in Disclosure of Climate-Related Risks and Opportunities." www.tcfdhub.org/scenario-analysis. Accessed April 18, 2023.

Theisen, Ole Magnus. 2017. "Climate Change and Violence: Insights from Political Science." *Current Climate Change Reports* 3 (4): 210–21. https://doi.org/10.1007/s40641-017-0079-5.

Tubi, Amit, Lee Mordechai, Eran Feitelson, Paul Kay, and Dan Tamir. 2022. "Can We Learn from the Past? Towards Better Analogies and Historical Inference in Society–Environmental Change Research." *Global Environmental Change* 76 (September): 102570. https://doi.org/10.1016/j.gloenvcha.2022.102570.

von Uexkull, Nina, and Halvard Buhaug. 2021. "Security Implications of Climate Change: A Decade of Scientific Progress." *Journal of Peace Research* 58 (1): 3–17.

Wagner, Gernot, and Martin L. Weitzman. 2015. *Climate Shock: The Economic Consequences of a Hotter Planet*. Princeton, NJ: Princeton University Press.

Wallace-Wells, David. 2019. *The Uninhabitable Earth: Life After Warming*. First edition. New York: Tim Duggan Books.

Wang, Xinyu, Xiangfeng Meng, and Ying Long. 2022. "Projecting 1-Km-Grid Population Distributions from 2020 to 2100 Globally under Shared Socioeconomic Pathways." *Scientific Data* 9 (1): 563. https://doi.org/10.1038/s41597-022-01675-x.

Werrell, Caitlin E., and Francesco Femia. 2019. "The Responsibility to Prepare and Prevent: A Climate Security Governance Framework for the 21st Century." *The Center for Climate & Security*, October 31. https://climateandsecurity.org/the-responsibility-to-prepare-and-prevent-a-climate-security-governance-framework-for-the-21st-century.

Wilkinson, Angela, and Roland Kupers. 2013. "Living in the Futures." *Harvard Business Review*, May 1. https://hbr.org/2013/05/living-in-the-futures.

Witmer, Frank D. W., Andrew M. Linke, John O'Loughlin, Andrew Gettelman, and Arlene Laing. 2017. "Subnational Violent-Conflict Forecasts for Sub-Saharan Africa, 2015–65, Using Climate-Sensitive Models." *Journal of Peace Research* 54 (2): 175–92.

Xu, Chi, Timothy A. Kohler, Timothy M. Lenton, Jens-Christian Svenning, and Marten Scheffer. 2020. "Future of the Human Climate Niche." *Proceedings of the National Academy of Sciences* 117 (21): 11350–55. https://doi.org/10.1073/pnas.1910114117.

https://doi.org/10.1017/S104909652300032X Published online by Cambridge University Press

https://doi.org/10.1017/S104909652300032X Published online by Cambridge University Press