LETTERS
https://doi.org/10.1038/s41558-018-0068-2

nature climate change

Sampling bias in climate–conflict research

Courtland Adams[1], Tobias Ide[1,2*], Jon Barnett[1] and Adrien Detges[3]

Critics have argued that the evidence of an association between climate change and conflict is flawed because the research relies on a dependent variable sampling strategy[1–4]. Similarly, it has been hypothesized that convenience of access biases the sample of cases studied (the 'streetlight effect'[5]). This also gives rise to claims that the climate–conflict literature stigmatizes some places as being more 'naturally' violent[6–8]. Yet there has been no proof of such sampling patterns. Here we test whether climate–conflict research is based on such a biased sample through a systematic review of the literature. We demonstrate that research on climate change and violent conflict suffers from a streetlight effect. Further, studies which focus on a small number of cases in particular are strongly informed by cases where there has been conflict, do not sample on the independent variables (climate impact or risk), and hence tend to find some association between these two variables. These biases mean that research on climate change and conflict primarily focuses on a few accessible regions, overstates the links between both phenomena and cannot explain peaceful outcomes from climate change. This could result in maladaptive responses in those places that are stigmatized as being inherently more prone to climate-induced violence.

A growing number of policymakers, journalists and scholars are linking climate change to violent conflict[9]. Nevertheless, scientific evidence of this relationship remains elusive due to heterogeneous research designs, variables, data sets and scales of analysis[10,11]. Amid the array of disparate findings is a core of meta-analyses that are based on statistical methods[12,13] as well as several in-depth studies linking climate change to highly prominent conflicts such as those in Darfur or Syria[14,15].

Critics of this research point to an array of methodological problems, and to a lesser extent a deeper underlying problem with a study design that selects only cases where conflict is present or where data are readily available[1–4,10]. Researchers have, for instance, intensively studied the impact of a multi-year drought on the onset of the Syrian civil war in 2011, while there is little analysis of responses to the same drought in Jordan or Lebanon, where no large-scale violence erupted[16]. So, if the evidence of a causal association between climate and violent conflict is informed only by exceptional instances where violent conflict arises and climate also varies in some way, it is unable to explain the vastly more ubiquitous and continuing condition of peace under a changing climate.

Other critics of the research claiming a link between climate change and violent conflict have pointed to the way it stigmatizes some places—most often 'Africa' or a few African countries—as being more naturally violent than others. It does this ignoring the many similar and/or proximate places where peaceful responses are the norm, and the complex political, economic and institutional factors that cause violence and peace[4,6,8,17]. Such 'mappings of danger' can undermine the confidence of investors, local people and international donors and hence undermine sustainable development. They change the climate policy challenge from being one of adaptation with and in the interests of local people, to one of interventions to secure peace in the interests of those who fear the risk of contagious conflict and instability[6,18].

So, it is important to understand whether the research claiming a link between climate change and violent conflict is based on a biased sampling strategy. Yet the extent to which this is the case remains untested. We therefore survey the relevant academic literature for the period 1990–2017 using the Scopus database and a systematic review—a method often used to analyse large bodies of literature with a high degree of rigour and replicability, and which is described in the Methods section with data provided in Supplementary Datasets 1 and 2[19,20].

The analysis of the relevant literature shows that Africa is by far the most frequently mentioned continent (77 mentions), followed by Asia (45) (see Table 1). The dominant focus on Africa in the literature is largely stable over time (see Fig. 1). This is surprising given that Asia is also home to places that are politically fragile and highly vulnerable to climate change[21,22], but much more populous. Other continents with significant vulnerabilities to climate change (and that are at least in some places also prone to violent conflict), such as South America or Oceania, are hardly considered at all[21].

With respect to world regions, Sub-Saharan Africa was by far most frequently mentioned in the literature analysed (44 times), although the Middle East (22) and the Sahel (22) were also discussed often (see Table 1). At the country level, Kenya and Sudan were most frequently analysed by climate–conflict researchers (11 mentions), followed by Egypt (8) as well as India, Nigeria and Syria (7). Complete lists of the continents, world regions and countries discussed in climate–conflict research can be found in Supplementary Dataset 1.

To check whether the selection of cases is biased towards the dependent variable, we run a number of Poisson regressions (see Supplementary Tables 1–3 for the full results) using data on, among others, the number of times a country is mentioned in the literature and on battle-related deaths between 1989 and 2015[22]. Although the battle-related deaths data set is far from perfect and tends to underestimate small-scale violence (which many scholars believe is likely to be the most affected by climate change), it is currently the best global data set on violent conflict prevalence available.

The correlation between the number of mentions and a high death toll is positive and significant in all models (Fig. 2). This suggests that studies on climate–conflict links that research one or a few individual countries are disproportionally focusing on cases that are already experiencing violent conflict. Holding other factors constant, we estimate that countries with more than 1,000 battle-related deaths are mentioned almost three times as often as countries with a lower death toll. This is further supported by a comparison of the top ten countries of each list (Table 2). Six of the ten most-often-mentioned

[1]School of Geography, The University of Melbourne, Carlton Victoria, Australia. [2]Georg Eckert Institute, Braunschweig, Germany. [3]Department of Political and Social Sciences, Freie Universität Berlin, Berlin, Germany. *e-mail: ide@gei.de

Table 1 | Most frequently mentioned continents and world regions in climate–conflict publications

By continent		By world region	
Africa	77	Sub-Saharan Africa	44
Asia	54	Middle East	22
Europe	7	Sahel	22
South America	6	North Africa	13
Arctic	5	South Asia	12
North America	5	Central Asia	8
Oceania	1	Arctic	6
		South America	6

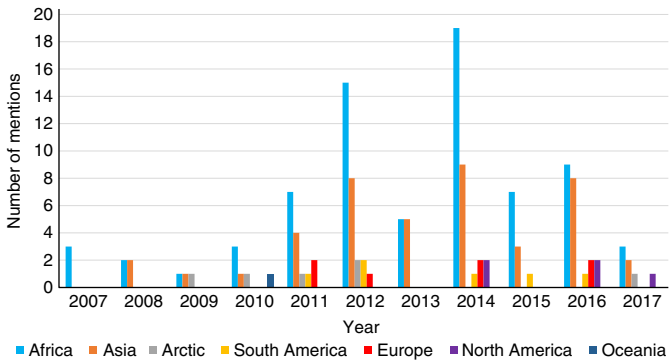

Fig. 1 | Frequency of mentions of continents in the climate–conflict literature per year. The bars illustrate how frequently a continent was mentioned in the climate–conflict literature per year (2007–2017). No bar indicates that the continent was not mentioned in this year.

countries are also among the ten countries with the most battle-related deaths. The four remaining countries are also characterized by significant numbers of battle-related deaths, ranging from 2,775 (Egypt) to 8,644 (South Sudan).

In contrast, the sampling of countries to be studied seems to be barely informed by the independent variable. A high exposure and a high vulnerability to climate change according to the ND-GAIN index[23] are negatively, but not significantly, correlated with the number of times a country is mentioned (Fig. 2). The same holds true for the correlation with our climate risk measure based on the Global Climate Risk Index (CRI)[24], although correlations are mostly significant here (Fig. 2), indicating that countries less at risk from climate change are more often discussed in the climate–conflict literature.

Table 3 adds further evidence to this claim. None of the ten most climate change-affected countries according to the ND-GAIN exposure score or the CRI are among the top ten countries considered in the climate–conflict literature. Further, the literature on climate change and conflict does not discuss 11 of these 20 high-climate risk-countries at all (Guatemala, Haiti, Honduras, Kiribati, Marshall Islands, Micronesia, Nicaragua, Philippines, Seychelles, Tuvalu and Yemen), despite many of them being characterized by significant political instability. There may be several reasons for these disparities, which include a greater interest in conflict-prone countries, issues of accessibility (discussed in the next paragraph) and a preference for studying countries with a higher global political relevance.

The literature largely agrees that climate change is a 'threat multiplier' that aggravates existing tensions. It would hence make little sense to focus predominantly on countries that are politically very stable. Also, several analyses explicitly select their cases based on a number of scope conditions that are hypothesized to make climate–conflict links more likely[16,25]. But if studies (especially when analysing a small number of cases) focus on places that are already suffering from intense violent conflict, while highly vulnerable countries receive little attention, results may be distorted and significant knowledge gaps left unaddressed. In line with this, we find

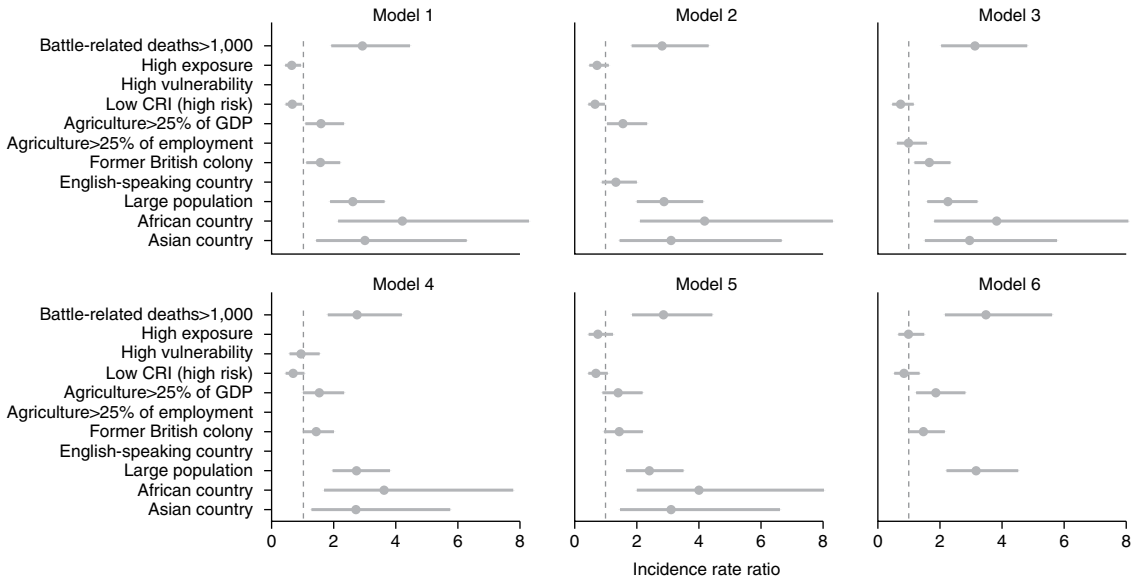

Fig. 2 | Changes in the frequency of mentions in the climate–conflict literature depending on country characteristics. Relative changes in the frequency with which countries are mentioned in the climate–conflict literature depending on climatic and other characteristics (estimated incidence rate ratios are shown, with 95% confidence intervals in grey). Estimated changes are not significant at the 5% level where confidence intervals cross the dashed line. Model 1 analyses the full sample. Model 2 includes English-speaking country instead of former British colony. Model 3 replaces Agriculture>25% of GDP with Agriculture>25% of employment. Model 4 uses high vulnerability rather than high exposure to climate change. Model 5 drops Kenya and Sudan from the analysis. Model 6 includes only African countries.

Table 2 | Countries most often mentioned in climate–conflict literature and countries with most battle-related deaths

Rank	Number of mentions		Battle-related deaths	
1	Kenya	11	Rwanda	520,599
2	**Sudan**	**11**	**Syria**	**280,474**
3	Egypt	8	Afghanistan	180,839
4	**India**	**7**	**Ethiopia**	**176,868**
5	**Nigeria**	**7**	**Iraq**	**106,721**
6	**Syria**	**7**	DR Congo	101,966
7	Israel/Palestine	6	**Sudan**	**91,727**
8	**Ethiopia**	**5**	Sri Lanka	65,372
9	**Iraq**	**5**	**India**	**54,194**
10	South Sudan	5	**Nigeria**	**47,488**

Countries that appear in both lists are highlighted with bold text. DR Congo; Democratic Republic of the Congo.

that further climate sensitivity measures such as the contribution of the agricultural sector to employment (negative, insignificant effect) and to gross domestic product (GDP; slightly positive and significant, but not robust effect) are weak predictors for the number of mentions (Fig. 2).

Our results further indicate a streetlight effect in climate–conflict research, that is, researchers tend to focus on particular places for reasons of convenience[5]. On the continent level, the availability of conflict data might have played an important role, especially as statistical analyses are very widespread in climate–conflict research[10]. Large geo-referenced conflict data sets spanning several countries and longer time periods were until very recently only available for Africa[26]. Indeed, when just considering statistical studies ($n = 35$ in our sample), the focus on Africa as a continent (65%) and Sub-Saharan Africa as a region (57%) is even stronger than in the full sample.

On the country level, all models reveal a positive and significant correlation between the numbers of mentions in the literature and countries that are former British colonies (Fig. 2). A likely explanation for this finding is that countries formerly colonized by Great Britain have better data (for example, historic weather records), which makes research more convenient[5]. Further, in four of the six most-mentioned countries (Sudan, Kenya, India and Nigeria). English is an official language (which makes research more practicable for many Western scholars). However, the positive correlation between these two factors indicated by model 2 (Fig. 2) is not significant. The presence of a streetlight effect in climate–conflict research is a reason for concern as it suggests that case selection (and hence knowledge production) is driven by accessibility rather than concerns for the explanation or practical relevance[27].

One should note that the database we used for the literature search (Scopus) mainly captures journal articles that are written in English. Including French and Spanish language journals would probably yield a different picture of countries and regions most frequently mentioned.

The statistical findings provided by this study are robust to the use of different model specifications, the inclusion of further control variables, and the removal of the two most frequently mentioned countries (Kenya and Sudan) from the analysis (see Fig. 2 and the Supplementary Information for further information). Results also hold when analysing Africa only, hence suggesting that the detected sampling biases occur not only on a global scale, but are also valid for the continent most intensively discussed in climate–conflict research.

To conclude, critics have warned for some time that environmental security and climate–conflict research tend to choose cases on the dependent variable[2,3,28]. Our study provides the first systematic, empirical evidence that such claims are warranted. Studies focusing on one or a few cases tend to study places where the dependent variable (violent conflict) is present and hardly relate to the independent variable (vulnerability to climate change). In addition, climate–conflict research strongly focuses on cases that are most convenient in terms of field access or data availability.

To be clear, we do not intent to criticize individual studies, which often have good reasons to focus on specific regions, countries and phenomena. However, the sampling biases of the climate–conflict research field as a whole are deeply problematic for at least four reasons.

First, they convey the impression that climate–conflict links are stronger or more prevalent than they actually are[3]. This is especially the case for studies using few cases. Large-*N* studies usually contain a large number of non-conflict cases in their sample, although they draw all of these cases from a few regions or countries (see below).

Second, focusing strongly on cases of violent conflict limits the ability of (qualitative) researchers to study how people adapt peacefully to the impacts of climate change or carry out the associated conflicts non-violently[4,29]. Such knowledge, however, would be particularly valuable from a policy-making perspective.

Third, evidence of climate–conflict links comes primarily from few regions and countries that are convenient to access, such as (Sub-Saharan) Africa. This is even more of an issue in large-*N*, statistical analyses. While such a bias is not problematic per se as

Table 3 | Countries most often mentioned in the climate–conflict literature compared with the countries most exposed to and at risk from climate change

Rank	Number of mentions		Exposure score		Climate Risk Index	
1	Kenya	11	Rwanda	0.622	Honduras	11.33
2	Sudan	11	Kiribati	0.620	Myanmar	14.17
3	Egypt	8	Burundi	0.617	Haiti	18.17
4	India	7	Zambia	0.613	Nicaragua	19.17
5	Nigeria	7	Tuvalu	0.612	Philippines	21.33
6	Syria	7	Marshall Islands	0.600	Bangladesh	25.00
7	Israel/Palestine	6	Yemen	0.597	Pakistan	30.50
8	Ethiopia	5	Seychelles	0.582	Vietnam	31.33
9	Iraq	5	Oman	0.568	Guatemala	33.83
10	South Sudan	5	Micronesia	0.567	Thailand	34.83

considerable parts of (Sub-Saharan) Africa are vulnerable to both climate change and conflict, this also implies that other very vulnerable regions, for instance in Asia and especially in South America and Oceania, receive little scholarly attention.

Finally, over-representing certain places leads to them being stigmatized as inherently violent and unable to cope with climate change peacefully[4,6]. This is particularly the case for Africa as a continent, the world regions Sub-Saharan Africa and the Middle East, and countries such as Kenya, Sudan or Egypt. Such stigmatization might contribute to the re-production of colonial stereotypes, especially as 81% of the first authors in our sample were affiliated with institutions in countries that are members of the Organisation for Economic Co-operation and Development (OECD). And it can also provide legitimation for the imposed security responses in certain places at the expense of co-produced adaptation responses in all places at risk from climate change[17,18,30].

Methods

Methods, including statements of data availability and any associated accession codes and references, are available at https://doi.org/10.1038/s41558-018-0068-2.

Received: 30 July 2017; Accepted: 3 January 2018;
Published online: 12 February 2018

References

1. Buhaug, H. et al. One effect to rule them all? A comment on climate and conflict. *Climatic Change* **127**, 391–397 (2014).
2. Buhaug, H. Climate–conflict research: some reflections on the way forward. *WIREs Clim. Change* **6**, 269–275 (2015).
3. Gemenne, F., Barnett, J., Adger, W. N. & Dabelko, G. Climate and security: evidence, emerging risks, and a new agenda. *Climatic Change* **123**, 1–9 (2014).
4. Raleigh, C., Linke, A. & O´Loughlin, J. Extreme temperatures and violence. *Nat. Clim. Change* **4**, 76–77 (2014).
5. Hendrix, C. S. The streetlight effect in climate change research on Africa. *Glob. Environ. Change* **43**, 137–147 (2017).
6. Barnett, J. The price of peace (is eternal vigilance): a cautionary editorial essay on climate geopolitics. *Climatic Change* **96**, 1–6 (2009).
7. Ide, T. Critical geopolitics and school textbooks: the case of environment–conflict links in Germany. *Polit. Geogr.* **55**, 61–70 (2016).
8. Verhoeven, H. Gardens of Eden or Hearts of Darkness? The genealogy of discourses on environmental insecurity and climate wars in Africa. *Geopolitics* **19**, 784–805 (2014).
9. McDonald, M. Discourses of climate security. *Polit. Geogr.* **33**, 42–51 (2013).
10. Ide, T. Research methods for exploring the links between climate change and conflict. *WIREs Clim. Change* **8**, 1–14 (2017).
11. O'Loughlin, J., Linke, A. M. & Witmer, F. D. W. Modeling and data choices sway conclusions about climate–conflict links. *Proc. Natl Acad. Sci. USA* **111**, 2054–2055 (2014).
12. Hsiang, S., Burke, M. & Miguel, E. Quantifying the influence of climate on human conflict. *Science* **341**, 1–14 (2013).
13. Hsiang, S. & Burke, M. Climate, conflict, and social stability: what does the evidence say? *Climatic Change* **123**, 39–55 (2014).
14. Kelley, C. P., Mohtadib, S., Cane, M. A., Seager, R. & Kushnir, Y. Climate change in the Fertile Crescent and implications of the recent Syrian drought. *Proc. Natl Acad. Sci. USA* **112**, 3241–3246 (2015).
15. De Juan, A. Long-term environmental change and geographical patterns of violence in Darfur, 2003–2005. *Polit. Geogr.* **45**, 22–33 (2015).
16. Feitelson, E. & Tubi, A. A main driver or an intermediate variable? Climate change, water and security in the Middle East. *Glob. Environ. Change* **44**, 39–48 (2017).
17. Hartmann, B. Rethinking climate refugees and climate conflict: rhetoric, reality and the politics of policy discourse. *J. Int. Dev.* **22**, 233–246 (2010).
18. Dalby, S. Recontextualising violence, power and nature: the next twenty years of critical geopolitics? *Polit. Geogr.* **29**, 280–288 (2010).
19. Ford, J. D., Berrang-Ford, L. & Paterson, J. A systematic review of observed climate change adaptation in developed nations. *Climatic Change* **106**, 327–336 (2011).
20. Downes, B. J., Miller, F., Barnett, J., Glaister, A. & Ellemor, H. How do we know about resilience? An analysis of empirical research on resilience, and implications for interdisciplinary praxis. *Environ. Res. Lett.* **8**, 1–9 (2013).
21. IPCC *Climate Change 2014: Impacts, Adaptation, and Vulnerability* (eds Field, C. B. et al.) (Cambridge Univ. Press, 2014).
22. Melander, E., Pettersson, T. & Themnér, L. Organized violence, 1989–2015. *J. Peace Res.* **53**, 727–742 (2016).
23. *Country Index Exposure 2015* (ND-GAIN, 2016); http://index.gain.org/ranking/vulnerability/exposure
24. Kreft, S., Ecksetin, D. & Melchior, I. *Global Climate Risk Index 2017* (Germanwatch, 2017).
25. Benjaminsen, T., Alinon, K., Buhaug, H. & Buseth, J. T. Does climate change drive land-use conflict in the Sahel? *J. Peace Res.* **49**, 97–111 (2012).
26. Bernauer, T. & Gleditsch, N. P. New event data in conflict research. *Int. Interact.* **38**, 375–381 (2012).
27. Expanding research views. *Nat. Clim. Change* **7**, 229 (2017).
28. Gleditsch, N. P. Armed conflict and the environment: a critique of the literature. *J. Peace Res.* **35**, 381–400 (1998).
29. Adano, W., Dietz, T., Witsenburg, K. M. & Zaal, F. Climate change, violent conflict and local institutions in Kenya's dryland. *J. Peace Res.* **49**, 65–80 (2012).
30. Fincher, R., Barnett, J. & Graham, S. Temporalities in adaptation to sea-level rise. *Ann. Assoc. Am. Geogr.* **105**, 263–273 (2015).

Acknowledgements

This research was completed with support from the Australian–American Fulbright Commission, the German Research Foundation (DFG) project ID80/2-1 and the Australian Research Council project FT120100208.

Author contributions

C.A., T.I., J.B. and A.D. designed the research, analysed the results and wrote the paper. C.A. performed the systematic literature review. A.D. and T.I. conducted the statistical analysis.

Competing interests

The authors declare no competing financial interests.

Additional information

Supplementary information accompanies this paper at https://doi.org/10.1038/s41558-018-0068-2.

Reprints and permissions information is available at www.nature.com/reprints.

Correspondence and requests for materials should be addressed to T.I.

Publisher's note: Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Methods

Systematic review of the literature. The primary method for analysing the academic literature on climate change and violent conflict is the extraction of quantitative data based on a systematic review, although this approach is complemented with qualitative knowledge about the research field if appropriate. Systematic reviews are widely used for summarizing the findings of large amounts of studies to reveal current trends in a given field of research, to identify knowledge gaps and to offer directions for future research[19,20].

Systematic reviews aim to analyse a given (and often large) body of literature with a high degree of rigour, transparency and replicability. In a first step, they define the phenomena and the relevant literature they are interested in. Thereafter, systematic reviews establish a selection strategy that clearly describes the methods used to collect documents and the criteria for including relevant documents for further analysis. Finally, systematic reviews iteratively extract information from the included documents using a coding scheme that qualitatively and/or quantitatively reconfigures pertinent information into a more meaningful form[31,32].

This study focuses on the geographical representations of the literature on climate change and violent conflict. Almost all publications in the research field analyse the (potential) impacts of climate change, such as higher temperatures or droughts. Consequentially, we include studies on such impacts as long as they are explicitly related to climate change. By contrast, we excludes studies on past, natural climatic changes because they yield only limited insights regarding the impact of current, anthropogenic climate change on violent conflict[33].

The relevant literature uses a range of different concepts and operationalizations of conflict in general and violent conflict in particular[34]. Our analysis is concerned with the debate of climate change and violent conflict in general rather than with specific types or definitions of conflict. Therefore, we focus on studies that link (the predicted impacts of) climate change to deliberate acts of physical violence perpetrated by states or organized non-state groups. Further, the analysis includes literature published between 1 January 1990 (the year the first Intergovernmental Panel on Climate Change (IPCC) report was published) and April 10 2017.

After having specified the literature of interest, we produce the corpus of relevant studies by using the Scopus database to search through the titles, abstracts and keywords of articles. The search focuses on articles as they are often peer-reviewed and speak from a position of academic authority. In addition, climate–conflict research is an article field in which almost all new insights and influential hypothesis are published in the form of articles (rather than books). Searching the full text is avoided to exclude studies that do not primarily deal with climate change and violent conflict but mention such links in passing.

The Boolean phrase used for the search is: ('climat*' OR 'global warming' OR 'weather') AND ('violen*' OR 'conflict' OR 'war' OR 'unrest'). 'Climat*' captures several relevant concepts such as climate, climate change, climate variability or climate impacts. 'Global warming' is a popular synonym for climate change. As some studies referring to the climate–conflict debate prefer terms such as weather extremes or weather variability, the term 'weather' is included as well[35,36]. 'Violen*' and 'war' are good indicators for violent conflicts as defined above, whereas 'conflict' is used by many authors as short-form for violent conflict[34]. Including 'unrest' is important as terms such as civil unrest frequently have violent connotations[37].

The resulting search yields 5,938 articles. The first author of this study reads through the titles, abstracts and keywords of these articles and dropped 5,749 because they either do not deal with climate change and violent conflict or fail to mention any location of (presumed) climate–conflict links. We focus on the title, abstract and keywords to keep the sample manageable and to make sure that only articles focusing on (rather than just briefly discussing) links between climate change and violent conflict are included in the sample. The remaining 189 articles are inspected in greater detail, including a screening of the full texts and discussions between the authors of which 'borderline' articles to incorporate into the sample. This second step of vetting excludes another 65 articles because they are primarily concerned with non-violent conflicts or with climate security more broadly.

We do not differentiate between articles whose results are supportive or skeptical towards links between climate change and violent conflict because even the most critical articles (i) indicate that the places in question are considered by the broader scholarly community as likely stages for climate-related violent conflict and (ii) might contribute to a streetlight effect or other forms of selective knowledge production in climate–conflict research[5,38,39]. Further, we do not add additional articles based on either our knowledge of the literature or the reference lists of the articles in the sample. Doing so would not have substantially changed the sample, but would make it harder to replicate the analysis. The final sample hence contains 124 articles in total (see Supplementary Dataset 2 for a full list of those articles).

To disentangle the geographical representations inherent in the literature, we code these articles for places that are identified as (past, present or future) stages of climate-related violent conflicts. If a location is mentioned without reference to a (supposed) link between climate change and violent conflict, it is not counted. Coding for location occurs using three distinct categories: continent, world region and country. Separating information into these three groups allows (i) clear distinctions to be made between more specific (for example, Kenya) and less specific (Africa, for example) locations as well as (ii) the analysis and comparison of findings on similar geographic scales[40]. We also note the country of the institutional affiliation of the first author of each study at the time of publication. See Supplementary Dataset 3 for a full list of the coding decisions for each article under consideration.

We follow an inductive approach grounded in the data when coding for world regions. Specifically, we use world regions that are either frequently mentioned in the literature, such as the Sahel, or represent geographically connected clusters of places that are frequently mentioned (such as Central Asia). For borderline countries, the coding decision is based on the geographic context in which the country is discussed. Turkey, for instance, is always discussed with regard to its water relations with Syria and Iraq and hence coded as part of the Middle East (region) and of Asia (continent). When specific physical geographic features such as rivers or mountain ranges are mentioned without explicit relation to the specific countries or world regions, all nested countries and world regions associated with that feature are extrapolated. Articles that mention the Arctic as a possible climate–conflict stage are coded as 'Arctic' in both the continent and world region categories (despite the 'Arctic' not being a continent in the conventional sense).

Statistical analysis. We use a Poisson regression model to test whether cases in the climate–conflict literature are selected based on their political, environmental, socioeconomic and geographic characteristics. We use likelihood ratio and Vuong tests to rule out more complex models—that is, a negative binomial or a zero-inflated Poisson model (results are available upon request). Our sample contains 183 countries. We use the number of battle-related deaths from the Uppsala Conflict Data Program (UCDP)[22] to test whether climate–conflict analyses select on the dependent variables. For ease of interpretation we use a binary indicator for countries with more than 1,000 battle-related deaths in total. Using such a binary indicator also minimizes the risk that the results are distorted by outlier cases (such as Rwanda) and moderate reporting biases. Results are stable when using a count variable instead (results are available upon request).

To test whether climate–conflict analyses select on the independent variable, we use several binary indicators that are based on climate risk and vulnerability measures from the ND-GAIN (2015 version) and Climate Risk Index (1996–2015 values) data sets[23,24]. To test for a possible streetlight effect, we use binary indicators for former British colonies and English-speaking countries.

We further use binary indicators for African and Asian countries to test for a regional selection bias. We also add a control for populated countries (2015 values)[41]. Population density and growths have been highly popular variables in early environmental security research and are also correlated with some of our explanatory variables. Finally, we include the contribution of the agricultural sector to a country's GDP and employment (2015, or most recent values)[42,43]. Both measures indicate an economic sensitivity to climate change that could be a key driver of case selection in climate–conflict research[44].

Descriptive statistics for all utilized variables can be found in Supplementary Table 1, along with a correlation table (Supplementary Table 2) and the full Poisson regression models (Supplementary Table 3).

Data availability. All data generated during this study are included in the published article and Supplementary Datasets 1–3. All data used for this study are fully referenced in the published article (including the Methods section).

References

31. Higgins, J. P. T. & Green, S. (eds) *Cochrane Handbook for Systematic Reviews of Interventions* version 5.1.0 (Cochrane Collaboration, London, 2011).
32. Ford, J. D. & Pearce, T. What we know, do not know, and need to know about climate change vulnerability in the western Canadian Arctic: a systematic literature review. *Environ. Res. Lett.* **5**, 1–9 (2010).
33. Zhang, D. D. et al. The causality analysis of climate change and large-scale human crisis. *Proc. Natl Acad. Sci. USA* **108**, 17296–17301 (2011).
34. Scheffran, J., Ide, T. & Schilling, J. Violent climate or climate of violence? Concepts and relations with focus on Kenya and Sudan. *Int. J. Human. Rights* **18**, 366–387 (2014).
35. Maystadt, J. F. & Ecker, O. Extreme weather and civil war: does drought fuel conflict in Somalia through livestock price shocks? *Am. J. Agric. Econ.* **96**, 1157–1182 (2014).
36. Theisen, O. M. Climate clashes? Weather variability, land pressure, and organized violence in Kenya, 1989-2004. *J. Peace Res.* **49**, 81–96 (2012).
37. Nardulli, P. F., Peyton, B. & Bajjalieh, J. Climate change and civil unrest: the impact of rapid-onset disasters. *J. Confl. Resolut.* **59**, 310–335 (2015).
38. Selby, J. Positivist climate conflict research: a critique. *Geopolitics* **19**, 829–856 (2014).
39. Hartmann, B. Converging on disaster: climate security and the malthusian anticipatory regime for Africa. *Geopolitics* **19**, 757–783 (2014).

40. Salehyan, I. Climate change and conflict: making sense of disparate findings. *Polit. Geogr.* **43**, 1–5 (2014).
41. *World Populations Prospects: The 2017 Revision* (United Nations, 2017).
42. *Employment in Agriculture (% of Total Employment)* (International Labour Organization, 2017); https://data.worldbank.org/indicator/SL.AGR.EMPL.ZS?locations=AL
43. *World Development Indicators: Contribution of the Agricultural Sector to GDP* (World Bank, 2017); https://data.worldbank.org/data-catalog/world-development-indicators
44. Ide, T. et al. On exposure, vulnerability and violence: spatial distribution of risk factors for climate change and violent conflict across Kenya and Uganda. *Polit. Geogr.* **43**, 68–81 (2014).