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Whither the weather? Climate change and conflict

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Abstract

Until recently, most writings on the relationship between climate change and security were highly speculative. The IPCC assessment reports to date offer little if any guidance on this issue and occasionally pay excessive attention to questionable sources. The articles published in this special issue form the largest collection of peer-reviewed writings on the topic to date. The number of such studies remains small compared to those that make up the natural science base of the climate issue, and there is some confusion whether it is the effect of ‘climate’ or ‘weather’ that is being tested. The results of the studies vary, and firm conclusions cannot always be drawn. Nevertheless, research in this area has made considerable progress. More attention is being paid to the specific causal mechanisms linking climate change to conflict, such as changes in rainfall and temperature, natural disasters, and economic growth. Systematic climate data are used in most of the articles and climate projections in some. Several studies are going beyond state-based conflict to look at possible implications for other kinds of violence, such as intercommunal conflict. Overall, the research reported here offers only limited support for viewing climate change as an important influence on armed conflict. However, framing the climate issue as a security problem could possibly influence the perceptions of the actors and contribute to a self-fulfilling prophecy.

Keywords

armed conflict, climate change, security, war

Violence is on the wane in human affairs, even if slowly and irregularly (Goldstein, 2011; Pinker, 2011). In recent years, however, pundits and politicians, along with a few scholars, have raised the specter that this encouraging trend towards peace might be reversed by environmental change generally and by climate change specifically. In his acceptance speech for the Nobel Peace prize, for instance, President Obama (2009) warned that ‘[t]here is little scientific dispute that if we do nothing, we will face more drought, more famine, more mass displacement – all of which will fuel more conflict for decades’. He would have been more accurate had he said that there is little if any scientific agreement about these points.

Despite the increasing certainty about global warming and the man-made contribution to it, the two central premises of the Intergovernmental Panel on Climate Change (IPCC), uncertainty continues about many of the physical consequences of climate change and even

more so about the social consequences. This uncertainty is compounded by confusion about the definition of ‘climate’, an issue to which I return below. The IPCC is not charged with the task of doing research; rather it ‘reviews and assesses the most recent scientific, technical and socio-economic information produced worldwide’.¹ In an area where little or no research has been conducted, the IPCC has a poor basis for an assessment. Therefore, the two most recent assessment reports (IPCC, 2001, 2007) had little to say about the security implications of climate change. Unfortunately, in the absence of peer-reviewed sources, these reports fell prey to the

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¹ From the IPCC homepage, www.ipcc.ch/organization/organization.shtml.

temptation to cite occasional 'grey material', particularly in the Africa chapter of the 2007 report (Nordås & Gleditsch, 2009). Indeed, a document explaining the principles for the preparation of its reports (IPCC, 2008) approves the use of non-peer reviewed sources in areas where few peer-reviewed sources are available. In a wide-ranging examination of the IPCC, the Inter-Academy Council, an umbrella organization of national academies of science, cited a study that found that while 84% of the sources for IPCC's Working Group 1 on the physical science basis derived from peer-reviewed sources, it was only 59% for Working Group 2 on the vulnerability of socio-economic and natural systems to climate change (IAC, 2010: 16). It also acknowledged that some governments, particularly in developing countries, had not always nominated the best experts, that the author selection process suffered from a lack of transparency, and that the regional chapters did not always make use of experts from outside the region (IAC, 2010: 18) – all of which sheds some light on the discussion of security issues in the Africa chapter in the 2007 report.

In the introduction to the first special issue of an academic journal devoted to the topic of climate change and conflict, Nordås & Gleditsch (2007) found little support for the climate–conflict nexus in the academic literature and outlined five priorities for future research in this area:

- a disentangling of the causal chains between climate change and conflict
- a tighter coupling of climate change models and conflict models
- a reconsideration of the kind of violence expected to result from climate change
- a balance of positive and negative effects
- an increased focus on the Third World where climate change will matter most.

Meanwhile, a number of studies relevant to the climate–conflict nexus have been published and this special issue adds 16 more. What have we achieved in terms of the five goals outlined in 2007?

Disentangling causal chains

Virtually all the articles in this special issue try to disentangle the causal chains between climate change and conflict.² By far the largest number of studies in the

² For a model of possible causal pathways from climate change to conflict, see Buhaug, Gleditsch & Theisen (2010: Figure 6).

literature generally and in this issue look at how climate variability and specifically changes in precipitation may affect conflict through adverse effects on rainfed agriculture or cattle herding.³ Adano et al (2012: 77), for instance, find for two districts in Kenya that 'more conflicts and killings take place in wet seasons of relative abundance' and Theisen (2012: 93), who also studies Kenya, concludes that 'years following wetter years [are] less safe than drier ones'. Butler & Gates (2012) derive a similar conclusion from a formal model. Benjaminsen et al. (2012: 108) state on the basis of the Mopti region of Mali, at the heart of the Sahel, that there is 'little evidence supporting the notion that water scarcity and environmental change are important drivers of inter-communal conflicts'.⁴ Hendrix & Salehyan (2012) conclude on the basis of a new database of social conflict in Africa, that rainfall deviations in either direction are associated with conflict, but that violent events are more responsive to heavy rainfall. Of course, while providing water in abundance, heavy rainfall can also produce subsequent scarcities through the damage caused by flooding. Raleigh & Kniveton (2012), on the basis of data from East Africa, also find that rainfall deviations in either direction are associated with conflict, but argue that civil war is more likely in anomalously dry conditions whereas wet conditions are more likely to be associated with non-state conflict. Koubi et al. (2012) investigate whether climate variability may influence armed conflict through its effect on economic development. Although their literature review leads them to hypothesize that climate variability should affect economic growth, they do not find (either in a global study or in a separate analysis for sub-Saharan Africa) any statistically significant impact of climate variability on growth. There is no general link between climate variability and conflict through economic growth, although autocracies may be more vulnerable to conflict through this mechanism. A few articles also have data on variations in temperature, a possible climate driver of conflict that has received considerable attention in a prominent cross-disciplinary journal (Burke et al., 2009; Buhaug, 2010).

Two of the articles here (Slettebak, 2012; Bergholt & Lujala, 2012) look at natural disasters as a cause of conflict, although the latter article also uses disasters as an

³ Although the importance of agriculture is assumed rather than measured in terms of employment or production.

⁴ Theisen, Holtermann & Buhaug (2011–12), who use disaggregated data for Africa, also find no relationship between drought and civil war.

instrument for economic shocks. While Slettebak concludes that there may be an increasing trend in climate-related natural disasters, he sharply contradicts earlier research on the link between natural disasters and conflict (e.g. Nel & Righarts, 2008) and finds support for an argument derived from crisis sociology that people tend to unite in adversity. Bergholt & Lujala find that natural disasters have a negative effect on economic growth, but that this does not translate into an increased risk of conflict. In a scenario study for sub-Saharan Africa, Devitt & Tol (2012) find that the impact of civil war and climate change on economic growth in Africa has been underestimated.

Despite much public concern about the effects of sea-level rise,⁵ this is not yet a theme that has received much attention in the conflict literature. Neither are there any articles on possible adverse security effects of possible countermeasures to climate change – the effect of biofuel on agricultural prices and possibly on food riots could have provided an interesting case.⁶

Climate models

Climate research provides an important source of data for much of the research on security effects. The majority of the articles in this issue make use of systematic data on levels and change of precipitation. Most of them use empirical data for the past few decades and assess the empirical regularities that can be assumed to continue at least in the near future. Only two of the articles (Bernauer & Siegfried, 2012 and De Stefano et al. 2012) cite projections from climate models as well, while Devitt & Tol (2012) use economic projections from IPCC's Special Report on Emission Scenarios. While our models of conflict are certainly imperfect, and the ability of social scientists to make predictions is limited (Schneider, Gleditsch & Carey, 2010; Ward, Greenhill & Bakke, 2010), current climate models and even data for the past few decades leave much to be desired in terms of forecasting accuracy and geographical precision.

Types of violence

Traditionally, research on armed conflict has concentrated on interstate war and civil war. By far the largest

killer in the 20th century, however, was one-sided violence (including genocide and politicide) and environmental change has already been linked by some to major episodes of such violence in Rwanda and Darfur.⁷ While so far there is not much evidence that robustly links climate change to major armed conflict of any of these three types, there is a more plausible argument that it may influence intergroup violence below the state level, 'nonstate violence' in the language of the Uppsala Conflict Data Program⁸ or intercommunal conflict in the language of Benjaminsen et al. (2012).

The bulk of the articles, however, deal with internal conflict. Although some of them focus exclusively on state-based civil conflicts, others examine non-state conflicts in a rural setting, or both types. None of the articles examine urban conflict or one-sided violence. Five of the articles in this issue examine aspects of interstate conflict, though for the most part at a lower level of violence – militarized disputes rather than major war. Water resources, in the form of shared rivers or aquifers, play a key role in four of these studies. De Stefano et al. (2012) assess the 276 international river basins for changes in water variability and institutional resilience. They map the basins most at risk for hydropolitical tension and discuss how to target capacity-building to strengthen resilience to climate change and the development of mechanisms for cooperation and conflict resolution. Tir & Stinnett (2012) find that water scarcity increases the risk of militarized conflict, but that institutionalized agreements can offset the risk. Bernauer & Siegfried (2012) examine the Syr Darya catchment, a promising candidate for a neo-malthusian conflict over international water resources, but conclude that a militarized interstate dispute is unlikely. Another worst case in terms of the potential for water conflict, the Israeli–Palestinian conflict, is discussed by Feitelson, Tamimi & Rosenthal (2012). They conclude that it is unlikely that climate change will directly influence the conflict, although the securitization of the water issue may affect the negotiating positions of the parties.

Balancing effects?

None of the articles in this issue focus on possible *positive* effects of climate change. In theory, despite the many

⁵ In a wide-ranging review of possible security implications of climate change, Scheffran & Battaglini (2011) include sea-level change as a source of potential conflict in South Asia.

⁶ For an ethical argument along these lines, see Gomiero, Paoletti & Pimentel (2010).

⁷ For skeptical discussions of the impact of climate change on the violence in Darfur, see Brown (2010) and Kevane & Gray (2008).

⁸ www.pcr.uu.se/research/ucdp/datasets/ucdp_non-state_conflict_dataset/.

pessimistic predictions about global food security under global warming,⁹ local or regional improvements in the conditions for food production might offset current food insecurity in some areas and help to lower the risk of local scarcity conflict. But this remains to be studied. Gartzke (2012) argues that economic development, which drives climate change, also lowers the risk of interstate conflict. Therefore, even if climate change drives conflict, the effect may not be visible if it is overshadowed by the peacebuilding effect of economic development. Perhaps the overriding concern with economic development in the Third World can also explain a surprising finding in Kvaløy, Finseraas & Listhaug (2012). Using worldwide public opinion data, they observe widespread concern about global warming, but lower rather than higher in countries that are expected to be more seriously affected.

Where it matters?

There is indeed a focus on the developing world. Apart from the articles with a global scope, there is a strong concentration on Africa, particularly south of the Sahara, while one article deals with the Middle East and another with Central Asia. The bloodiest wars in the second half of the 20th century occurred in East and Southeast Asia, but by the turn of the century there were fewer conflicts in these areas and those that remained were at much lower levels of severity. The scholarly community may have seen climate-related conflicts as more likely to arise in Africa because of that continent's heavy dependence on rainfed agriculture. But in view of the public concern about the effects of sea-level rise and the melting of the Himalayan glaciers, the impact of climate change

for conflict in Asia also seems like a worthwhile topic for future research.

Other concerns

Some case study-oriented researchers (Homer-Dixon, 1994; Kahl, 2006) have argued that many case studies find support for a scarcity model of conflict while large-N statistical research generally fails to do so (see e.g. Theisen, 2008). However, other case studies (e.g. Benjaminsen, 2008) are closer to the skeptical position. In this issue, and in the current literature generally, there is no systematic difference between case studies and statistical investigations. While some of the case study literature has been criticized for studying only the conflict cases (Gleditsch, 1998), it can also be faulted for relatively shallow case description and theoretical myopia. More recently, the large-N conflict literature has moved away from an exclusive reliance on the 'country-year' approach, towards geographical and temporal disaggregation (Cederman & Gleditsch, 2009). The ambition is to measure conflict as well as explanatory variables for short time intervals and for subnational regions or territorial grid cells. This approach seems particularly appropriate to the study of effects of variables such as climate change that do not vary along national boundaries, and it may help to bridge the gap between case studies and large-N studies.

One of the lessons that the large-N community could learn from proponents of case studies is the emphasis on interaction effects. Homer-Dixon (1994) and Kahl (2006) do not argue that environmental change generally and climate change specifically have a major impact on conflict – the effect plays out in interaction with exogenous conflict-promoting factors (Buhaug, Gleditsch & Theisen, 2008, 2010). Koubi et al. (2012) and Tir & Stinnett (2012) take a step in this direction in testing for interactions with institutions and regime type respectively. Kofi Annan (2006: 9–10) argued in one of his last reports as UN Secretary-General, that 'pollution, population growth and climate change are . . . occurring now and hitting the poorest and most vulnerable hardest. Environmental degradation has the potential to destabilize already conflict-prone regions, especially when compounded by inequitable access or politicization of access to scarce resources.' Here, he is invoking an interaction effect of climate change with no less than three other variables. Unfortunately, it seems unlikely that case study researchers or large-N scholars will launch a systematic investigation of such complicated interaction patterns any time soon.

⁹ IPCC (2007: WG2, Ch. 5, Section 5.8.1 Findings and key conclusions) concludes with high confidence that '[p]rojected changes in the frequency and severity of extreme climate events will have more serious consequences for food and forestry production, and food insecurity, than will changes in projected means of temperature and precipitation', that '[c]limate change increases the number of people at risk of hunger' but that '[t]he impact of chosen socio-economic pathways (SRES scenario) on the numbers of people at risk of hunger is significantly greater than the impact of climate change', and that '[c]limate change will further shift the focus of food insecurity to sub-Saharan Africa' (so that '[b]y 2080, about 75% of all people at risk of hunger are estimated to live in this region'), and (with medium confidence) that 'moderate warming benefits crop and pasture yields in mid- to high-latitude regions'. Collier, Conway & Venables (2010) argue that the grave consequences of climate change for agriculture in Africa should be countered by industrialization, urbanization, and new agricultural technology (including genetically modified organisms).

In reviewing an article for this issue, William Nordhaus¹⁰ was rather critical: 'this is a paper about weather, not climate'. The Glossary in IPCC (2007) defines climate as 'average weather', usually over a 30-year period.¹¹ Most of the studies reported here operate over shorter time periods, so this criticism has considerable substance, although Hendrix & Salehyan (2012) and Koubi et al. (2012) measure climate variation as deviations from long-term averages. A few recent studies take a very long-term perspective (e.g. Zhang et al., 2006 for China and Tol & Wagner, 2010 for Europe). With data for a whole millennium,¹² they conclude that war was more frequent in colder periods. However, Tol & Wagner add that the relationship weakens in the industrialized world. A plausible interpretation of this is that agricultural production suffers in the cold periods, but that with increasing industrialization the world moves away from malthusian constraints. The conflict data used in these studies have not been well tested and for obvious reasons there is a lack of control variables. Based on regularities observed by historians in the distant past and using UCDP/PRIO conflict data for the period 1950–2004, Hsiang, Meng & Cane (2011) argue that the El Niño/Southern Oscillation (ENSO) has a significant influence on the onset of civil conflict. The link to global warming is tenuous and questions have been raised about the robustness of this finding. But if it holds up, it provides another indication that armed conflict may be related to the climate even in the modern age. In any case, better integration between the long-term climate studies and the studies of 'weather' changes reported here, is a priority item on the research agenda.

Conclusions

Climate change is the world's first truly global man-made environmental problem¹³ and a firm warning that human activities can influence our physical environment on a global scale. The range of possible consequences of climate change is so wide, even for the limited

temperature changes foreseen in the IPCC scenarios, that it is difficult to sort out the main priorities. Obviously, if a reversal of the trend towards a more peaceful world was one of these consequences, it should have a prominent place on the policy agenda. Based on the research reported here, such a pessimistic view may not be warranted in the short to medium run. However, as noted by Feitelson, Tamimi & Rosenthal (2012) and Salehyan (2008), framing climate change as a security issue may influence the perceptions of the actors in local and regional conflict and lead to militarized responses and thus perhaps contribute to a self-fulfilling prophecy.

The study of the relationship between climate change and conflict has advanced noticeably in the past five years. With regard to how changes in precipitation may influence internal conflict, the one area where we now have a fair number of studies, the dominant view seems to be that rainfall abundance is associated with greater risks than drought and that in any case other conflict-generating factors are more important. Studies of how climate change may promote interstate conflict over water resources also seem to point in the direction of a weak or a null relationship. In other areas, the number of studies is still very low, so it is premature to offer a summary. On the whole, however, it seems fair to say that so far there is not yet much evidence for climate change as an important driver of conflict. In recent reviews of this literature, Bernauer, Böhmelt & Koubi (2012) and Gleditsch, Buhaug & Theisen (2011) conclude that although environmental change *may* under certain circumstances increase the risk of violent conflict, the existing evidence indicates that this is not generally the case.

While we primarily hope that the studies presented here will have an impact on scholarly research in this area, they could also have an influence on policymaking. The IPCC is currently working on its Fifth Assessment Report, scheduled for release in 2013. For the first time, this report will have a chapter on the consequences of climate change for human security, including armed conflict (IPCC, no date). We hope that the studies reported here will contribute to a balanced assessment by the IPCC, built on the best peer-reviewed evidence.

Acknowledgments

With a single exception (De Stefano et al.) the articles in this special issue are based on papers or presentations at the international conference on 'Climate Change and Security', held in Trondheim, Norway, 21–24 June 2010 under the auspices of the Norwegian Royal Society for Sciences and Letters, on the occasion of its 250th

¹⁰ Review, 16 November 2010; permission to cite by name, personal communication, 4 November 2011.

¹¹ For a critical discussion of different definitions of climate change, see Pielke (2005).

¹² Or even two, as in Zhang et al. (2010).

¹³ As distinct from international environmental problems such as transboundary pollution (acid rain, pollution in international rivers). The depletion of the ozone layer was another global problem. But it was solved quite rapidly through a mix of unilateral action and an international agreement, although it will take a few generations for the ozone layer to recover completely.

anniversary. A large 'thank you' is due to the Society and its sponsors for the anniversary conferences: NTNU, Statoil/Hydro, and the Norwegian Ministry of Education and Research. Generous additional financial support was provided by the Research Council of Norway. My fellow members of the organizing committee for the conference, Ola Listhaug and Ragnar Torvik, helped to shape the program, raise funds, and get the event off the ground. Rune Slettebak assisted the committee through the whole process, including the selection of conference papers and presentations invited to submit draft articles. Julien Bessière skillfully created and maintained the conference website. We are also grateful to all the participants of the conference and the dozens of reviewers, who have greatly influenced the contents of the special issue. Finally, most of the contributors to the special issue commented critically and constructively on a draft of this introduction, as did Andrew Mack, William Nordhaus, and Roger A Pielke Jr. None of them share any responsibility for whatever errors remain.

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