I. Exploring the climate–conflict link: the case of East Africa

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Introduction

The year 2016 was the warmest on record, with an average surface temperature about 1.1°C above the level in the late 19th century. Most of this warming has occurred in the past 35 years and 16 of the 17 warmest years have occurred since 2001.[1] The rising temperatures have been particularly noticeable in the Arctic. Arctic temperatures in the winter of 2016–17 were up to 25°C above normal winter temperatures.[2] The extent of the polar Arctic ice cap also reached a new record low in the winter of 2016–17.[3]

Extreme weather events continued to increase in severity and number in 2016. In some places these manifested as extreme rainfall and flooding, in others as heatwaves. Unusually prolonged droughts also affected California in the United States, north-west China and East Africa throughout 2016. The impacts of these events and changes in climate are often dire for human health and livelihoods. In addition to assessing how the impacts of climate change affect human security and societies across the world, scholars and policymakers are now more frequently linking these impacts to increased risk of violent conflict, particularly in fragile and conflict-prone contexts.[4]

In the past decade a large body of research has examined the link between climate change and violent conflict. Much of this research provides evidence that climate change affects violent conflict in or around the affected area, but most reviews of the academic literature have been unable to identify results that are robust across cases.[5] However, there is also broad recognition of this literature's theoretical and methodological shortcomings.[6] Some researchers have therefore emphasized the need to focus on the *mechanisms* through which climate change may affect the risk of violent conflict or the dynamics

[1] National Aeronautics and Space Administration (NASA), 'NASA, NOAA data show 2016 warmest year on record globally', Global Climate Change, 17 Jan. 2017.

[2] Samenow, J., 'It's about 50 degrees warmer than normal near the North Pole, yet again', *Washington Post*, 10 Feb. 2017.

[3] National Snow and Ice Data Center, 'Arctic sea ice maximum at record low for third straight year', 22 Mar. 2017.

[4] Adger, W. N. et al., 'Human security', Intergovernmental Panel on Climate Change, *Climate Change 2014, Impacts, Adaptation, and Vulnerability, Part A: Global and Sectoral Aspects, Working Group II Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge University Press: Cambridge, 2014).

[5] Salehyan, I., 'Climate change and conflict: making sense of disparate findings', *Political Geography*, vol. 43 (Nov. 2014), pp. 1–5; and Buhaug, H., 'Climate–conflict research: some reflections on the way forward', *WIREs Climate Change*, vol. 6, no. 3 (May/June 2015), p. 269.

[6] Meierding, E., 'Climate change and conflict: avoiding small talk about the weather', *International Studies Review*, vol. 15, no. 2 (June 2013), pp. 185–203; Ide, T., 'Research methods for exploring the links between climate change and conflict', *WIREs Climate Change*, vol. 8, no. 2 (May/June 2017); Salehyan (note 5); and Buhaug (note 5).

of ongoing hostilities.[7] They argue that gaining a better understanding of these mechanisms improves the possibility of taking into account intermediating factors, which affect the social outcomes of climate change. Hence, greater knowledge of mechanisms is essential for refining research on the climate–conflict link and is conducive to better policymaking, since a deeper understanding of mechanisms enables the development of effective strategies to prevent or solve conflicts that are associated with climate change.[8] This section evaluates these mechanisms through a review of the research on the climate–conflict link in East Africa.[9] First, an overview of the general climate–conflict research is provided.

Overview of the climate change and violent conflict literature

Over the past decade a growing body of research has examined whether a climate–conflict link exists and under what conditions climate change is, or could be, linked to violent conflict. Some of this research explores a direct link between climate variables, predominately precipitation and temperature, and the outcome of violent conflict. Other research focuses on how the impacts of climate change affect livelihood conditions as well as factors that are known to increase the risk of violent conflict, such as low per capita economic growth, economic shocks and weak state institutions.[10]

Based on a broad assessment, the climate–conflict literature does not yet identify a link between climate and conflict in a robust way. Existing research shows that climate change is *sometimes* linked to an increased risk, or a change in the dynamics, of violent conflict.[11] That said, there are also several examples of seemingly contradictory findings from individual

[7] The term 'mechanism' is used for a process that links specific conditions with specific outcomes. In this chapter, it is the process that links climate change to the social outcome of violent conflict, without presuming a simple stimulus–response relationship between a changing climate and violent conflict. See e.g. Seter, H., 'Connecting climate variability and conflict: implications for empirical testing', *Political Geography*, vol. 53 (July 2016), pp. 1–9; Seter, H., Theisen, O. M. and Schilling, J., 'All about water and land? Resource-related conflicts in East and West Africa revisited', *GeoJournal* (Dec. 2016); Meierding (note 6); and Buhaug (note 5).

[8] Vivekananda, J., Schilling, J. and Smith, D., 'Climate resilience in fragile and conflict-affected societies: concepts and approaches', *Development in Practice*, vol. 24, no. 4 (2014), pp. 487–501.

[9] van Baalen, S. and Mobjörk, M., *A Coming Anarchy? Pathways from Climate Change to Violent Conflict in East Africa*, Research Report (Stockholm University/SIPRI/Swedish Institute of International Affairs: Stockholm, 2016). See also van Baalen, S. and Mobjörk, M., 'Climate change and violent conflict in East Africa: integrating quantitative and qualitative research to probe the mechanisms', *International Studies Review* (forthcoming).

[10] Adger et al. (note 4).

[11] Nordås, R. and Gleditsch, N. P., 'Climate change and conflict', *Political Geography*, vol. 26, no. 6 (Aug. 2007), pp. 627–638; Gleditsch, N. P., 'Whither the weather? Climate change and conflict', *Journal of Peace Research*, vol. 49, no. 1 (Jan. 2012), pp. 3–9; Gemenne, F. et al., 'Climate and security: evidence, emerging risks, and a new agenda', *Climatic Change*, vol. 123, no. 1 (Mar. 2014), pp. 1–9; and Salehyan (note 5).

studies.[12] Reviews of the quantitative literature also reflect this disparity.[13] An assessment report on the published literature issued in 2014 by the Intergovernmental Panel on Climate Change (IPCC), which works under the auspices of the United Nations, describes the evidence of a direct link between climate and conflict as 'contested'. However, it also concludes that research examining the indirect effects shows that already known drivers of violent conflict, such as economic shocks or weak state institutions, are vulnerable to the impacts of climate change.[14] These findings, thus, accentuate the importance of focusing on the impacts of climate change on societies and how these impacts interplay with context-specific vulnerabilities. This raises the question of the extent to which these issues have been examined in the existing literature.

As noted above, there is broad agreement about the theoretical and methodological shortcomings of the existing climate–conflict research literature.[15] Some of these shortcomings relate to data selection, the time span investigated and the methods used to consider context-specific vulnerabilities. However, research into the climate–conflict link has become increasingly sophisticated over time. Early attempts to conduct correlation-based investigations into climate variables—predominately temperature and rainfall, and the onset of violent conflict, often understood in terms of high-intensity conflict such as civil war—have been replaced by much more refined and careful analyses. These analyses have emerged from a broader understanding of violent conflict and include communal conflict and other forms of low-intensity conflict. There has also been a noticeable shift towards a stronger focus on examining the impacts of climate change rather than the changes in climate variables, and on considering context-specific vulnerabilities. This shift is needed since changes in temperature or precipitation do not in themselves cause stress in societies; rather, such stress is caused by the impacts these changes have on human livelihoods. Hence, context-based analyses that

[12] See e.g. Burke, M. B. et al., 'Warming increases the risk of civil war in Africa', *Proceedings of the National Academy of Sciences*, vol. 106, no. 49 (Dec. 2009), pp. 20 670–74; and Buhaug H., 'Climate not to blame for African civil wars', *Proceedings of the National Academy of Sciences*, vol. 107, no. 38 (Sep. 2010), pp. 16 477–82.

[13] See e.g. Hsiang, S. M., Burke, M. and Miguel, E., 'Quantifying the influence of climate on human conflict', *Science* (13 Sep. 2013); and Buhaug, H., 'One effect to rule them all? A comment on climate and conflict', *Climatic Change*, vol. 127, no. 3 (Dec. 2014), pp. 391–97.

[14] Adger et al. (note 4), p. 758; Koubi, V. et al., 'Do natural resources matter for interstate and intrastate armed conflict?', *Journal of Peace Research*, vol. 51, no. 2 (2014), pp. 227–43; and Bergholt, D. and Lujala P., 'Climate-related natural disasters, economic growth, and armed civil conflict', *Journal of Peace Research*, vol. 49, no. 1 (2012), pp. 147–62.

[15] Ide, T. and Scheffran, J., 'On climate, conflict and cumulation: suggestions for integrative cumulation of knowledge in the research on climate change and violent conflict', *Global Change, Peace & Security*, vol. 26, no. 3 (2014), pp. 263–79; Meierding (note 6); Salehyan (note 5); and Buhaug (note 5).

Box 8.1. Climate change and time perspectives

The Intergovernmental Panel on Climate Change defines 'climate change' as 'a change in the state of the climate that can be identified ... by changes in the mean and/or the variability of its properties and that persists for an extended period, typically decades or longer'. This means that to investigate climate change, the period examined needs to be at least two to three decades. Very few studies on the climate–conflict link take such long-term perspectives, focusing instead on short-term variability in the climate. This means that the analyses do not capture how climate variability changes over time, which involves how climate events such as rapid-onset extreme weather events or slow-onset droughts become more intense, prolonged and/or frequent. The short-term approach dominating climate–conflict research precludes not only the possibility of investigating the long-term impacts of climate change, but also the ability to take into account delayed effects and feedback loops.

Source: Intergovernmental Panel on Climate Change (IPCC), *Climate Change 2014: Synthesis Report* (IPCC: Geneva, 2014), p. 120.

take into account existing vulnerabilities and adaptive capacity are key when investigating how climate change affects a society.[16]

However, a stronger focus on climate impacts and context-specific vulnerabilities, and a broader understanding of violent conflict are not sufficient to inform a robust understanding of the link between climate change and violent conflict. Another set of shortcomings in the literature also needs to be addressed, namely (*a*) the theoretical explanations adopted, which inform empirical studies and choices of data; and (*b*) the difficulty of empirically observing a link between structural factors such as climate change with rare social outcomes such as violent conflict. In general, the quantitative research has been weak on theory about how and under what circumstances climate change impacts are expected to increase the risk of violent conflict.[17]

Scholarly analysis of climate change and violent conflict emerges from both quantitative and qualitative research approaches. However, in reviews or meta-analyses of this literature there is a strong bias in favour of quantitative research.[18] Some researchers have recognized this bias and have emphasized the need to pay greater attention to qualitative and mixed-method studies (i.e. research that includes both quantitative and qualitative approaches), which are particularly useful in providing a theoretical under-

[16] Steinbruner, J. D., Stern, P. C. and Husbands, J. L. (eds), *Climate Change and Social Stress: Implications for Security Analysis* (National Academies Press: Washington, DC, 2013); and Klein, R. J. T. et al., 'Adaptation opportunities, constraints, and limits', Intergovernmental Panel on Climate Change, *Climate Change 2014, Impacts, Adaptation, and Vulnerability, Part A: Global and Sectoral Aspects, Working Group II Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge University Press: Cambridge, 2014), pp. 899–943.

[17] Buhaug (note 5).

[18] Ide and Scheffran note that of 6 review articles in high-impact journals, only 2 involve qualitative studies, and in both those cases disproportionally. See Ide and Scheffran (note 15), p. 270; and Ide (note 6).

standing of the climate–conflict link.[19] One way of doing this is to focus on the mechanisms through which climate change might affect the risk of violent conflict or the dynamics of already ongoing hostilities.[20] Both qualitative and quantitative methodologies have a role to play when assessing mechanisms. Qualitative methodologies are particularly important because they take into account multiple intermediating factors, while quantitative methodologies can help to identify patterns across several cases. Accordingly, there is a need to engage in careful synthesis of both quantitative and qualitative research. The recent literature on mixed-method approaches contributes to a better theoretical understanding of the mechanisms linking climate change to violent conflict.[21]

Key elements for consideration in an analysis of mechanisms

The examination of mechanisms has become critical to investigating *how* climate change might translate into violence and *under what conditions* it tends to do so. Mechanisms label the process that links climate change to the social outcome of violent conflict without presuming a simple or deterministic stimulus–response relationship between a changing climate and the violent conflict. Previous research has identified three key elements that require further attention when analysing the link between climate change and violent conflict in terms of mechanisms: time, space and the sociopolitical context.[22] First, time is crucial to an analysis of climate change, which involves short-, medium- and long-term impacts (see box 8.1). Second, the impacts of climate change tend to be trans-boundary—for example, precipitation in one area can have socio-economic consequences in another area. Therefore, the geographical distribution of impacts needs to be taken into account. Third, the impacts of climate change are dependent on the sociopolitical context and the ability of those affected to cope with, and adapt to, changes. There is broad agreement among researchers that these three elements must be examined as part of any in-depth analysis of the climate–conflict link. Indeed, much of the apparent contradiction in the literature seems to stem from a failure to consider all of these elements appropriately.[23]

Despite researchers' increasing interest in mechanisms, few attempts have been made to delve deeper into this form of analysis. The examples of such research that do exist differ in terms of their regional focus and approach

[19] Buhaug (note 5); and Salehyan (note 5).

[20] Meierding (note 6); Buhaug (note 5); and Seter (note 7).

[21] Seter (note 7); van Baalen and Mobjörk, *A Coming Anarchy? Pathways from Climate Change to Violent Conflict in East Africa* (note 9); and Ide and Scheffran (note 15).

[22] Salehyan (note 5); Buhaug (note 5); Seter (note 7); and van Baalen and Mobjörk, *A Coming Anarchy? Pathways from Climate Change to Violent Conflict in East Africa* (note 9).

[23] Salehyan (note 5); and Buhaug (note 5).

to the selection of studies for analysis.[24] The mechanisms in focus in these studies also vary, but tend to centre on resource scarcity, economic conditions and migration. The next subsection presents the key findings from one of these studies: a systematic investigation of the mechanisms linking climate-related change to violent conflict in East Africa.

Mechanisms linking climate change to violent conflict: the case of East Africa[25]

This subsection examines the mechanisms that link climate change to violent conflict.[26] This means a focus on *how* and *under what circumstances* climate change increases the risk of violent conflict or affects the dynamics of existing hostilities, rather than *whether* it does so. The analysis focuses on one region, East Africa, which has been the subject of a number of studies examining the climate–conflict link. Focusing on one region ensures a adequate level of cross-study comparability with regard to climate impacts and the history of violent conflict. The empirical data for this analysis consists of 44 scientific articles (encompassing both quantitative and qualitative methodologies) that have examined the relationship between climate change and violent conflict in East Africa.[27]

The literature on climate change and violent conflict in East Africa shows that changing rainfall patterns, drought, changes in vegetation cover and increasing resource scarcity have contributed to various types of violent conflict.[28] The link is particularly evident for conflicts involving pastoralists (i.e. livestock herders). Case study research also shows that these local resource conflicts are sometimes drawn into more intense power struggles

[24] See e.g. Barnett, J. and Adger, W. N., 'Climate change, human security and violent conflict', *Political Geography*, vol. 26, no. 6 (Aug. 2007), pp. 639–55; Koubi, V. et al., 'Climate variability, economic growth, and civil conflict', *Journal of Peace Research*, vol. 49, no. 1 (Jan. 2012), pp. 113–27; Seter, Theisen and Schilling (note 7); Ide, T., 'Why do conflicts over scarce renewable resources turn violent? A qualitative comparative analysis', *Global Environmental Change*, vol. 33 (July 2015), pp. 61–70; Seter (note 7); and van Baalen and Mobjörk, *A Coming Anarchy? Pathways from Climate Change to Violent Conflict in East Africa* (note 9).

[25] This subsection builds on the study by van Baalen and Mobjörk. For details on the methods and analysis, including references to all articles analysed, see van Baalen and Mobjörk, *A Coming Anarchy? Pathways from Climate Change to Violent Conflict in East Africa* (note 9).

[26] The term 'violent conflict' is used as an umbrella term for all the different types of armed conflict excluding interstate conflict. It is defined as 'deliberate violent acts perpetrated by a government or organized or semi-organized group against state forces, other organized or semi-organized groups or civilians'. van Baalen and Mobjörk, *A Coming Anarchy? Pathways from Climate Change to Violent Conflict in East Africa* (note 9), p. 8.

[27] These articles were identified through a systematic search process using key words encompassing different climate change variables and climate impacts, and different forms of violent conflict. For details about this search process see van Baalen and Mobjörk, *A Coming Anarchy? Pathways from Climate Change to Violent Conflict in East Africa* (note 9).

[28] van Baalen and Mobjörk, *A Coming Anarchy? Pathways from Climate Change to Violent Conflict in East Africa* (note 9).

related to civil war. This does not mean that climate change automatically causes violent conflict—the political, social and economic context is often key. Within the literature four interlinked mechanisms can be identified for why and when climate change increases the risk of violent conflict in East Africa: (*a*) worsening livelihood conditions; (*b*) migration and changing pastoral mobility patterns; (*c*) tactical considerations of armed groups; and (*d*) exploitation of local grievances by the elite. These mechanisms can be divided into two categories. The first two mainly relate to the causes of conflict, while the latter two mainly relate to changing conflict dynamics.

Worsening livelihood conditions

The worsening of livelihood conditions is a key point when examining the climate–conflict nexus in East Africa. Since a large part of the local population relies on rain-fed agriculture and pastoralism, the negative impact of climate change on people's livelihoods can be severe.[29] When changes in the environment are combined with other livelihood pressures, such as political marginalization, groups may become more prone to solving conflicts through violence or securing access to resources by force.

In the climate–conflict literature on East Africa two explanations are frequently provided for worsening livelihood conditions: (*a*) the loss of income from agriculture; and (*b*) the loss of income from pastoralism. Both explanations are underpinned by the notion of decreasing opportunity costs.[30] This notion suggests that worsening livelihood conditions are related to an increased risk of violent conflict because people believe—or act in accordance with such a belief—that they have less to lose from using violence or joining armed groups when their livelihood is threatened. This does not mean that violence is inevitable or that environmental change necessarily leads to worsening livelihood conditions. Instead, it illustrates that the risk of violence increases in a region that is characterized by high vulnerabilities to the impacts of climate change and a close dependency between livelihood conditions and economic incomes.

Both the case studies and statistical studies in the literature under review find that the risk of violent conflicts in East Africa increases during periods when climate conditions are unfavourable for agriculture and pastoralism.[31]

[29] Raleigh, C. and Kniveton, D., 'Come rain or shine: an analysis of conflict and climate variability in East Africa', *Journal of Peace Research*, vol. 49, no. 1 (Jan. 2012), p. 54.

[30] Miguel, E., Satyanath, S. and Serengenti, E., 'Economic shocks and civil conflict: an instrumental variables approach', *Journal of Political Economy*, vol. 112, no. 4 (Aug. 2004), pp. 725–53.

[31] Ember, C. R. et al., 'Rain and raids revisited: disaggregating ethnic group livestock raiding in the Ethiopian–Kenyan border region', *Civil Wars*, vol. 16, no. 3 (2014), pp. 300–27; O'Loughlin, J. et al., 'Climate variability and conflict risk in East Africa, 1990–2009', *Proceedings of the National Academy of Sciences*, vol. 109, no. 45 (Nov. 2012), pp. 18 344–49; Raleigh and Kniveton (note 29); and Maystadt, J.-F., Calderone, M. and You, L., 'Local warming and violent conflict in North and South Sudan', *Journal of Economic Geography*, vol. 15, no. 3 (May 2015), pp. 649–71.

Very warm temperatures in the region are associated with livestock losses and harmful effects on crops. Studies show, for instance, that droughts can force pastoralists in countries such as Somalia, South Sudan and Sudan to sell more of their livestock, which in turn depresses prices. This triggers economic decline and makes people more prone to participating in livestock raiding or joining armed groups.[32] Studies have shown similar effects in Kenya, where in the Turkana district, for example, the frequency of livestock-related violence increases during exceptionally dry months. This violence can be linked to intense competition among pastoralist groups over natural resources.[33]

In sum, worsening livelihood conditions are primarily found to increase the risk of less intense forms of violent conflicts, such as livestock raiding and communal conflict. Moreover, research shows that this risk is most severe in vulnerable communities with a history of violence.[34] Differences in adaptation capacity and levels of vulnerability between communities also mean that communities can withstand worsening livelihood conditions for varying periods of time. Violence does not automatically follow when people's livelihoods are under stress, and joint efforts to solve environmental problems can sometimes contribute to better inter-group relations.[35] Hence, an important step for research and policy is to develop a better understanding of why some communities are resilient while others are not.

Migration and changing pastoral mobility patterns

This second mechanism focuses on how climate and environmental changes affect migration and mobility patterns. While it is seldom possible to identify the precise importance of climate change to the decision to migrate, especially since these changes also affect other drivers of migration, there is broad agreement in the existing literature that climate change does impact on levels of migration.[36] The pace at which climate change affects livelihood conditions leads to differing patterns of migration and mobility: sudden-onset changes such as floods usually cause immediate and often

[32] Maystadt, J.-F. and Ecker. O., 'Extreme weather and civil war: does drought fuel conflict in Somalia through livestock price shocks?', *American Journal of Agricultural Economics*, vol. 96, no. 4 (2014), pp. 1157–82.

[33] Ember, C. R. et al., 'Livestock raiding and rainfall variability in Northwestern Kenya', *Civil Wars*, vol. 14, no. 2 (2012), pp. 159–81.

[34] See e.g. Schilling, J., Opiyo, F. E. O. and Scheffran, J., 'Raiding pastoral livelihoods: motives and effects of violent conflict in North-Western Kenya', *Pastoralism*, vol. 2 (Dec 2012), pp. 1–16; Ember et al. (note 31); and Ide, T. et al., 'On exposure, vulnerability and violence: spatial distribution of risk factors for climate change and violent conflict across Kenya and Uganda', *Political Geography*, vol. 43 (Nov. 2014), pp. 68–81.

[35] Ide and Scheffran (note 15), p. 274.

[36] Foresight, *Migration and Global Environmental Change: Future Challenges and Opportunities*, Final Project Report (Government Office for Science: London, 2011); and Brzoska, M. and Fröhlich, C., 'Climate change, migration and violent conflict: vulnerabilities, pathways and adaptation strategies', *Migration and Development*, vol. 5, no. 2 (2016), pp. 190–210.

temporary displacement, whereas slow-onset changes such as drought often involve a circular migration—that is, a repetitive movement between different areas. Migration is also closely intertwined with adaptation, where migration is both an adaptation strategy to worsening livelihood conditions and a response to failed adaptation.[37]

The climate–conflict research on East Africa shows that migration can increase the risk of violent conflict through two interrelated sub-mechanisms. First, in areas severely affected by resource scarcities high levels of inward migration can pose additional burdens on the economic resource base, which increases the risk of local resource conflicts. The research identifies the movement of herds by pastoralist groups to areas that are richer in water and grassland as a particularly important migration and changing mobility pattern, as this leads to more intense competition over those resources.[38] These conflicts have occurred both between the different migrating pastoralist groups and between migrating pastoralist groups and the people already in situ. Second, and closely related to the first, migration and changing mobility patterns are primarily linked to violent conflict in communities that lack shared conflict resolution institutions.[39] Pastoralist groups employ mobility as an adaptation strategy to avoid the negative effect of seasonal climate variability. When such groups follow their traditional migration routes, they tend to negotiate access and adhere to customary agreements.[40] However, when the environmental conditions change they seek new migration routes, where customary agreements may not exist or where the local population may be unable to cope with rising pressures on resources, thereby increasing the risk of violence. This pattern has been observed across the region, but particularly in Ethiopia, Kenya, South Sudan and Sudan.

Importantly, several studies show that migration or changing mobility patterns in East Africa are primarily linked to violent conflict in areas where there are relatively more resources and where livelihood conditions are generally better. This has caused some confusion among researchers and has led to contradictory findings. However, a close examination of how changes are transmitted across geographical areas can resolve this quandary. For

[37] Brzoska and Fröhlich (note 36), p. 198.

[38] Lee, J. R., *Climate Change and Armed Conflict: Hot and Cold Wars* (Routledge: Abingdon, 2009); Adem, T. A. et al., 'Dangerous geography: spatial distribution of livestock raiding in Northwestern Kenya', *Ethnology*, vol. 51, no. 1 (2012), pp. 1–29; Ember et al. (note 33); Ember et al. (note 31); and Detges, A., 'Close-up on renewable resources and armed conflict: the spatial logic of pastoralist violence in Northern Kenya', *Political Geography*, vol. 42 (Sep. 2014), pp. 57–65.

[39] De Juan, A., 'Long-term environmental change and geographical patterns of violence in Darfur, 2003–2005', *Political Geography*, vol. 45 (Mar. 2015), pp. 22–33.

[40] Adano, W. R. et al., 'Climate change, violent conflict and local institutions in Kenya's drylands', *Journal of Peace Research*, vol. 49, no. 1 (2012), p. 74; Linke, A. M. 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*, vol. 34 (Sep. 2015), p. 38.

instance, examining the correlation between drought and violent conflict in the same locality presupposes an underlying theoretical explanation that a drought in one locality should increase the risk of violent conflict in that very same locality. This is an approach taken in some statistical analyses and has been used to draw the conclusion that drought does not affect violent conflict.[41] However, this conclusion is only valid if it is argued that these two phenomena are expected to be closely linked in one geographical setting. By contrast, studies that consider spatial issues show that droughts, under some circumstances, increase the risk of violent conflict through affecting migration and mobility patterns.[42] Accordingly, recognizing the mechanism of migration and mobility patterns might also explain why violent conflict primarily occurs where there are relatively favourable resources: it is in these areas that the competition for resources increases. The primary cause of the conflict could still be worsening livelihood conditions, but it is mediated through the mechanism of migration and mobility patterns.

Tactical considerations of armed groups

The two mechanisms mentioned above focus on how climate change may act as a factor that generates or triggers violent conflict. By contrast, there are studies that focus on how weather patterns and climate variability affect the dynamics of ongoing conflicts by influencing the tactical considerations of armed groups.[43]

Most studies of the climate–conflict link in East Africa focus on livestock-related violence. These studies show how weather patterns and climate variability affect tactical considerations, since they determine the level of camouflage and the mobility of forces and materiel.[44] Several studies also show that livestock-related violence increases during wet periods. Interviews with pastoralists in Kenya provide some explanations for this: the wet season is an opportune time for livestock raiding as vegetation and surface water are present and animals are well fed and strong.[45] Thicker vegetation is associated with increased livestock-related violence in, for instance, Kenya and Uganda, and with armed conflicts in Ethiopia, Somalia, South Sudan and Sudan.

[41] Theisen, O. M., Holtermann, H. and Buhaug, H., 'Climate wars? Assessing the claim that drought breeds conflict', *International Security*, vol. 36, no. 3 (winter 2011/12), pp. 79–106. See also Salehyan (note 5).

[42] De Juan (note 39).

[43] Meier, P., Bond, D. and Bond, J., 'Environmental influences on pastoral conflict in the Horn of Africa', *Political Geography*, vol. 26, no. 6 (Aug. 2007), pp. 716–35; Witsenburg, K. M. and Adano, W. R., 'Of rain and raids: violent livestock raiding in Northern Kenya', *Civil Wars*, vol. 11, no. 4 (Dec. 2009), pp. 514–38; Adano et al. (note 40); Adem et al. (note 38); Raleigh and Kniveton (note 29); Ember et al. (note 31).

[44] Witsenburg and Adano (note 43).

[45] Witsenburg and Adano (note 43).

Research identifying that violence rises during wet periods has been taken as evidence that resource abundance increases the risk of violent conflict.[46] This contrasts with the findings presented above showing that violent conflict increases when climate conditions are unfavourable for agriculture and pastoralism. However, closer examination of these studies shows that they explore different aspects of violent conflict; the former focus on *when* it is most opportune to engage in raiding rather than *why*. Qualitative research on livestock raiding offers numerous motives for engaging in this activity, including climate and environmental changes as well as cultural practices and the commercialization of livestock raiding.[47] Researchers and policymakers need to exercise caution when comparing these studies and be aware of the different research focuses as well as the various motives of the livestock raiders—only some of which may be related to environmental stress. An analysis encompassing the tactical considerations of armed groups mechanism illustrates how climate change also affects the dynamics of violent conflict and how different climate conditions provide diverse opportunities to engage in violence.

Exploitation of local grievances by the elite

Most resource-related violent conflicts in East Africa are relatively low-intensity conflicts among loosely organized groups at the local level. However, such local conflicts sometimes become integrated into larger processes of civil war, ethnic cleansing and insecurity. This integration can be explained by a mechanism labelled 'exploitation of local grievances by the elite'. This mechanism provides insight on how local struggles over scarce resources are ripe for exploitation by the elite, since the elite can capitalize on existing grievances and tensions, and because the organizational structures necessary for violence are already present. Hence, this mechanism does not explain why violent conflict occurs; instead, it adds a dimension to the dynamics of conflict and how local conflicts can be exploited in larger conflicts.

Research shows that exploitation of local grievances by the elite is a mechanism that is particularly apparent in South Sudan and Sudan, where local resource conflicts are intrinsically linked to regional and national power struggles.[48] Similar processes have also been observed in Ethiopia, Kenya, Rwanda and Uganda. In Kenya, for example, the government sought to

[46] Seter (note 7).

[47] See e.g. Schilling, Opiyo and Scheffran (note 34); Ember et al. (note 31); and Hundie, B., 'Conflicts between afar pastoralists and their neighbors: triggers and motivations', *International Journal of Conflict and Violence*, vol. 4, no. 1 (2010), pp. 134–48.

[48] Selby, J. and Hoffmann, C., 'Rethinking climate change, conflict and security', *Geopolitics*, vol. 19, no. 4 (2014), pp. 747–56; and Chavunduka, C. and Bromley, D. W., 'Climate, carbon, civil war and flexible boundaries: Sudan's contested landscape', *Land Use Policy*, vol. 28, no. 4 (Oct. 2011), pp. 907–16.

discredit the push for democratization in the early 1990s by orchestrating ethnic violence between pastoralist groups and farmers, a political manipulation made possible by existing resource-related grievances.[49]

Policy implications

This section has highlighted four mechanisms that can explain how and under what circumstances climate change increases the risk of violent conflict in East Africa. It draws on a systematic review of the combined quantitative and qualitative literature for the region. These four mechanisms are interlinked and complement each other. Together, they provide a theoretical underpinning, which is needed to deepen knowledge on the climate–conflict link. While this knowledge is important for improving the empirical research, it is also vital for policymaking. The review of the climate–conflict research for East Africa outlines three key areas of relevance for policymaking.

First, a central claim in the climate–conflict literature is that worsening environmental conditions make people more likely to join armed groups or engage in violence. An overarching implication of this is that efforts to lower the impact of climate change and strengthen climate resilience may also contribute to lowering the risk of violent conflict. However, since a large part of the population in East Africa is dependent on rain-fed agriculture and pastoralism, specific adaptation measures targeting those vulnerabilities should be considered. These measures include: (*a*) weather insurance systems; (*b*) improved access to local markets for agricultural products; and (*c*) income diversification for pastoralists. All these measures may be beneficial for strengthening local resilience.

Second, the analysis shows that pastoralist groups are often at the centre of violent conflict in East Africa. This means that policies that decrease their vulnerability to climate change could play a positive role in limiting the risk of violent conflicts in the region. Since mobility is part of pastoralism, policies must be better suited to creating institutions that facilitate peaceful seasonal migration. Suggestions include: (*a*) educational services adapted to mobile populations; and (*b*) transparent and flexible land boundaries along with supporting institutions and processes that can handle potential conflicts between farmers and pastoralist groups, and between different pastoralist groups, over, for example, access to water and grazing.

Third, there is a need to strengthen existing conflict resolution mechanisms. The climate–conflict research provides a strong case for strengthening the focus on sociopolitical issues in mitigating the negative impacts

[49] Kahl, C. H., 'Population growth, environmental degradation, and state-sponsored violence: the case of Kenya, 1991–93', *International Security*, vol. 23, no. 2 (1998), pp. 80–119.

of climate change. Where institutions for conflict resolution are absent, corrupt or non-functional, the risk of violent conflict over scarce resources increases. Stronger efforts are needed both to adapt local conflict resolution mechanisms to meet the new demands, and to increase the functionality and legitimacy of central and district level institutions.

Climate change involves a long-term and large-scale transformation of livelihood conditions that causes adverse impacts in already fragile and conflict-prone contexts. Importantly, what the climate–conflict research shows is that humans do not respond mechanically to changes in livelihood conditions. Instead, people and societies are flexible and can adapt to changing livelihood conditions. Incorporating the notion of human agency into analysis would therefore improve knowledge on how and under what circumstances climate change increases the risk of violent conflict. It would also provide the foundation for investigating how peace could be maintained or shaped despite vast pressures, including those from the impacts of climate change.