PART VI:
CLIMATE CHANGE, SECURITY AND THE MIGRATION DEBATE

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Science, Facts and Fears: The Debate on Climate Change and Security

Marcel Leroy & Fana Gebresenbet

Abstract

A broad range of studies have attempted to identify pathways through which climate change could contribute to conflict. Resource scarcity and climate-induced migration are two avenues which have received ample attention. The link between precipitation and conflict has also been examined, and some excellent work has been done regarding the impact of temperature on conflict. On balance, however, there is mixed evidence about the security implications of climate change. Furthermore, in many writings on the subject, scientific analysis takes a back seat to conjecture.

Studying the consequences of climate change requires examining a broad social context, including the role of governance. Recognising the wide range of social mechanisms and intellectual premises underlying the response of various cultures to new challenges is also essential. The multitude of choices in the process of adaptation reduces the scope for identifying 'standard' mechanisms through which societies react to climate change. Correspondingly, research methods and underlying premises need to encompass the full range of options through which cultures respond.

However, in scientific research – including the physical, social and life sciences – pressures to conform with prevailing thinking may restrict the scope of what is being investigated and, hence, limit the conclusions being advanced. In addition, many scientists cannot escape the ideological bent which shapes their worldviews and ends up pervading their work. Keeping in mind the perspectives of relativity and non-linearity, it is rarely warranted to 'predict' developments over a long-term horizon.

The 'securitisation' of the climate change debate, and predictions of dire consequences for future domestic and international stability, have contributed to raising the debate – and international negotiations on how to address climate change – to the realm of high politics. Identifying climate change as a security problem has encouraged state-sponsored reflection on possible

future scenarios, and on measures to be taken to mitigate risks to global security.

The global climate change debate is as much about perception as it is about science. Fear of the unknown has allowed doomsday sayers to dominate headlines, linking climate change with many evils and catastrophes. Alarmist statements have come from world leaders as well as from academics. Rather unusual alliances of interests appear to have been formed, with senior military officers drawing conclusions which sound rather similar to those of environmental activists.

This article places the debate on the security impact of climate change in a broad context, with a critical review of the literature produced by academics, government agencies, think tanks and non-governmental organisations. It analyses the assumptions and conclusions of this work, and makes recommendations on how to advance our understanding of the security implications of climate change.

A. Introduction

Global warming has moved to the top of the international agenda since the early 1990s. Although the warming effects of increasing carbon dioxide levels in the atmosphere had been understood since the late 19th Century,[1] there was no widespread fear that increasing these levels would engender drastic changes – physical or social – in the further development of the so-called blue planet. In fact, following a period of cooling from the 1940s to the early 1970s, some climate scientists drew a linear extrapolation to conclude that the world might be sliding into a new ice age.[2]

This article looks at possible links between climate change and conflict. It addresses the science, perceptions and myths surrounding the current debate on security implications of global climate change. The article also reviews government-sponsored studies, and comments on some academic research dealing with the climate change–conflict nexus. While there is no intention to limit the geographic scope of the analysis, specific examples refer mostly to Africa, which is often seen as the 'canary in the coalmine'

1 Arrhenius (1896:237–239).

2 For a good overview of contemporary scientific and popular literature, see Morano (2009).

of climate security – the first continent expected to experience the full effect of climate change on political and economic stability.

B. The Science of Global Warming

The trend toward global warming is now unmistakable. At the end of 2007, the World Meteorological Organization (WMO) concluded that the 11 years with the highest mean global temperatures – since reliable methods to collect weather data were put in place globally in the second half of the 19th Century – had occurred since 1995.[3] The year 2009 was the second warmest on record, and the decade 2000–2009 the warmest ever.[4] The WMO indicated that nine years of the 2001–2010 period were among the top ten warmest on record. In spite of some anomalies, such as a cold winter in north-western Europe, 2010 was the warmest year on record, closely followed by 2005; 2011 was the 11th warmest, as well as the warmest compared with other La Niña years.[5]

The United States (US) National Oceanic and Atmospheric Administration (NOAA) reported that the first eight months of 2010 tied the same period in 1998 for the warmest combined land and ocean surface temperature on record worldwide.[6] This trend continued into 2012. The US National Snow and Ice Data Center in Boulder, Colorado, reported on 16 September 2012 that Arctic ice covered about 3.4 million km^2, which is about three quarters of a million square kilometres below the previous record low set in 2007, and 50% below the 1979–2000 average.[7] It has also been reported that the mean annual temperature of the North Sea rose by 1.7°C from 1962 to 2012, as measured in the vicinity of the German island Helgoland by the Alfred Wegener Institute.[8] NOAA also identified the summer of 2012 as the third hottest on record.[9]

It is now almost universally accepted that human action since the Industrial Revolution has triggered a greenhouse effect. Moreover, it is likely to

3 WMO (2007).
4 NASA (2010).
5 WMO (2011).
6 NOAA (2010).
7 New York Times (2012); De Standaard (2012a).
8 De Standaard (2012b).
9 NOAA (2012).

take decades before the release of greenhouse gases (GHGs) – including methane, which accounts for about 20% of the total observed warming[10] – can be stabilised. Even if global efforts succeeded in rolling back GHG emissions, the warming effect of past emissions would linger for decades.

GHGs already released will eventually break down, but their residence time in the atmosphere varies greatly. While methane breaks down after 12 years, the mean breakdown time for nitrous oxide is 114 years.[11] The atmospheric lifetime of the bulk of carbon dioxide released through burning fossil fuels has been estimated at 300 years, but about a quarter of this carbon dioxide lingers for thousands of years.[12] Furthermore, the oceans have absorbed about 84% of the total heating of the earth over the last 40 years,[13] being retained for decades and creating a 'thermal flywheel effect' which could also counteract any cooling tendencies which might occur.

C. Facts and Fears

The global climate change debate is at least as much about perception as it is about science. Fear of the unknown tends to take hold of people's psyche, overtaking reason and caution. At times, alarmist language is used with quasi-religious overtones.[14] Doomsday sayers have dominated the headlines, linking climate change with many evils and catastrophes.

Decision-makers, academics and journalists have made linkages of varying intensity between climate change and conflict. United Nations (UN) Secretary General Ban Ki Moon stated that "the Darfur conflict began as an ecological crisis, arising at least in part from climate change", with a progression from drought to scarcity and violence.[15] French President Nicolas Sarkozy was more explicit when he addressed a meeting of ministers from the world's major economies in April 2008:[16]

> In Darfur, we see this explosive mixture from the impact of climate change, which prompts migration by increasingly impoverished people, which then has

10 Lassey (2007:120).
11 GHG Management Institute (2010).
12 Archer (2005:3).
13 Barnett et al. (2005); Levitus et al. (2005).
14 Hulme (2008:7).
15 Moon (2007).
16 AFP (2008).

> consequences in war. If we keep going down this path, climate change will encourage the migration of people with nothing towards areas where the population do have something, and the Darfur crisis will be only one crisis among dozens of others.

In 2007, former United Kingdom (UK) Foreign Secretary Margaret Beckett, at the first-ever UN Security Council debate on the impact of climate change, stated that –[17]

> [r]ecent scientific evidence has given us a picture of the physical impacts on our world as our climate changes. And those impacts go far beyond the environmental. Their consequences reach to the very heart of the security agenda.

The language of climate change as a security threat has been applied not only to highlight the risks attributed to the phenomenon itself, but also against the polluters themselves. At an African Union debate in early 2007, President Yoweri Museveni of Uganda called GHG emissions an "act of aggression" by the developed world against the developing world.[18] And at the 2007 UN Security Council debate on the impact of climate change, the Namibian representative Kaire Mbuende called GHG emissions tantamount to "low intensity biological or chemical warfare".[19]

It must be acknowledged that the 'securitisation' of the climate change debate – and international negotiations on reducing GHG emissions – has allowed this debate to be invested with a greater sense of urgency, raising climate change to the realm of high politics and creating space for serious commitments. This has assisted climate campaigners to mobilise support for strong action on mitigation and adaptation. Identifying climate change as a security problem suggests that it is an issue that warrants "a policy response commensurate with war, in effort if not in kind".[20]

D. Climate Change and Security

The ability to reduce complex matters to bite-size morsels is a valuable skill for politicians to possess. By simplifying the questions being addressed, political leaders may be able to offer clear choices and facilitate decision-making. However, governments have increasingly recognised the complexity of

17 UNSCDPI (2007).
18 Brown & Crawford (2008).
19 UNSCDPI (2007).
20 Barnett (2001).

the climate change/security nexus and have also commissioned rather elaborate studies in order to define the implications of climate change.

A study commissioned by the US Department of Defense[21] and carried out by 11 retired military officers came up with some rather sweeping conclusions. These include the contentions that –[22]

- "projected climate change poses a serious risk to America's national security"
- "climate change will provide the conditions that will extend the war on terror", and
- "projected climate change will add to tensions even in stable regions of the world".

The authors of the US study recognise that the impact of climate stress and extreme weather events is likely to be more severe under conditions of weak governance. They also argue, however, that climate change has the potential to trigger "multiple chronic conditions, occurring globally within the same time frame". Their judgement sounds rather ominous:[23]

> Overall, climate change has the potential to disrupt our way of life and force changes in how we keep ourselves safe and secure by adding a new hostile and stressing factor into the national and international security environment.

The German Advisory Council on Global Change, composed of nine scientists from Germany and other European countries, and working under a mandate of the German federal cabinet, was more modest and nuanced in its conclusions.[24] It focused on how governance and political systems are likely to be affected by climate change, concluding that states with weak governance will be particularly vulnerable. The need for addressing the impact of climate change will place additional demands on governments, pushing countries with weak steering and problem-solving capacities further toward fragile statehood. Also, by imposing economic costs, such as reducing agricultural yields and triggering migratory movements, climate change will reinforce obstacles to development.[25]

Furthermore, the German study attempts to identify linkages between the risk for conflict and climate-induced environmental changes. These include

21 CNA (2007).
22 (ibid.:6–7).
23 (ibid.:6).
24 WBGU (2007).
25 (ibid.).

degradation of freshwater resources, declining food production, increases in extreme weather events, and environment-induced migration. There may also be a spillover effect of the social impacts of climate change, transcending borders and expanding the geographic range of conflicts. Such risks are exacerbated when accompanied by weak governance and rapid population growth.[26]

A study commissioned by the Danish Ministry of Foreign Affairs and carried out by Oli Brown and Alec Crawford on behalf of the International Institute for Sustainable Development concentrates on West Africa, in particular the country-level security impacts of climate change in Burkina Faso and Ghana.[27] Although the African continent is least responsible for GHG emissions, it may in the end be the most severely affected by climate change through increasingly scarce water, reduced agricultural yields and encroaching deserts. In his foreword to the report, Ib Petersen, State Secretary for the Ministry of Foreign Affairs, says that these developments may cause destabilising population movements, raise tensions over dwindling resources, and tip fragile states towards failure.[28]

In the UK, economist Sir Nicholas Stern – with a team of UK scientists and research centres – prepared a review on the economics of climate change for the Prime Minister and Chancellor of the Exchequer.[29] The review argues that developing countries are particularly vulnerable because of their tropical geography, high population growth, heavy dependence on agriculture, rapid urbanisation, weak infrastructures and lack of resources. The Stern Review concluded that climate change could exacerbate poverty and endanger development in the poorest countries, forcing millions to migrate internally and across borders in search of food and water, thereby worsening prospects for security, education and gender equality. Rising global temperatures will put growing numbers of people at risk of hunger.[30]

The European Commission and the European Union's High Representative for Common Foreign and Security Policy catalogued the different forms of conflicts which may be driven by climate change, as follows:[31]

26 (ibid.).
27 Brown & Crawford (2008).
28 (ibid.).
29 Stern (2006:11–12).
30 (ibid.).
31 EU (2008).

- Conflict over resources as a result of shortage of water, diminishing fish stocks and drops in agricultural productivity
- Economic damage to megacities and coastal zones resulting from rises in sea level
- Environment-induced migration
- Increased instability by overstretching weak and failing states, and
- Pressures on international governance resulting from resentment between those most responsible for climate change and those most affected by it.

A report by the Swedish Defence Research Agency[32] indicates that research on climate change and armed conflicts largely uses a state-based concept of *security*, while discourse on climate change and vulnerability tends to be based on the concept of *human security*.[33] Security analysis centres on risks which may affect a state's energy security, economic security or environmental security. However, the effects of global climate change form additional risks which may affect individuals as well as the state.[34]

Politicians tend to respond to popular perceptions, while government-sponsored studies proceed more analytically. Nevertheless, policies cannot ignore perceptions, which often acquire a quasi-factual status.

E. International Concerns

Multilateral agencies and international non-governmental organisations (NGOs) with a strong presence on the ground tend to look more at concrete situations and have generally come to nuanced conclusions about the security impact of climate change.

A study carried out by United Nations Environment Programme (UNEP) on post-conflict Sudan acknowledges that many factors that have little or no link to climate, environment or natural resources contribute to conflict in the country.[35] In addition, where environment and natural resource management issues are important, they are generally not the sole cause for tension, but only contributing factors.[36] The study nevertheless posits a strong link bet-

32 Totalforsvarets Forskningsinstitut, known as *FOI*.
33 Mobjörk et al. (2010).
34 (ibid.).
35 UNEP (2007:77–87).
36 (ibid.).

ween the occurrence of local conflict and environmental degradation of rangeland and rain-fed agricultural land in the drier parts of Sudan. UNEP further notes that struggles over the control of scarce resources – including fertile land and water – have been a factor in many conflicts, including those in Darfur and the Middle East. Moreover, a link to natural resources and environment has been found to double the chance for conflict relapse within the first five years of a peace agreement.[37]

A report on the human impact of climate change by the Global Humanitarian Forum – which was set up in 2007 by former UN Secretary General Kofi Annan and ceased operations in 2010 – treats conflicts as complex emergencies, and views climate change as a catalyst or threat multiplier. The report found that, at the time of its writing, evidence linking climate change to conflict was inconclusive.[38] Whereas it seems plausible that scarcity of water might engender conflict over shared water resources, for instance, the evidence is overwhelming that states have in the vast majority of cases addressed these issues through increased collaboration and resource-sharing agreements, with over 200 international water treaties negotiated in the last 50 years.[39]

The Pan African Climate Justice Alliance, an African civil society coalition on climate change and sustainable development, takes a similar view, stating that the relationship between climate change and security is complex, and that it is difficult to anticipate where conflicts may occur or to attribute conflicts directly to environmental changes.[40] The review by the Alliance further finds that competition for food, water, energy and land are possible pathways for climate change to contribute to conflict, as are unregulated migration, destabilised settlements, and an increased tendency to join armed groups as a result of reduced employment opportunities.

The former President of the International Crisis Group, Gareth Evans, notes that climate-induced changes can exacerbate humanitarian and security strains.[41] Nevertheless, he cautions against leaping "into confident predictions about the impact of climate in generating conflict".[42] The interaction between environmental and climate factors with governance and ethnic is-

37 UNEP (2009).
38 GHF (2009).
39 UNDP (2006).
40 PACJA (2009).
41 Evans (2008).
42 (ibid.:1).

sues complicates any attempts at predicting when and where violence will break out. Thus, while climate change can certainly play a role in deadly conflicts, it is highly unlikely to be the sole or primary cause. Migrations and subsequent inter-group rivalry in areas where migrants settle have played an important role in many conflicts that have been described as 'environmental' or 'climate-induced'. It is particularly important, therefore, to understand the way in which climate change may induce migrations.[43]

Saferworld, an NGO with extensive experience in conflict-related research mostly funded by the European Commission, also sees climate-induced migrations as a possible source of insecurity in the regions of origin, transit and destination because of increased competition over already scarce resources and livelihoods.[44] Migrants face double insecurity: it is hard for them to find employment and provide for their basic needs, but they are also held responsible by already established residents for the increased competition for resources, and face the threat of reprisal from them.[45] Tensions between local and migrant communities over access to resources and employment could result in a breakdown in social cohesion and a rise in crime levels.[46]

This mechanism seems to apply to various cases studied by Saferworld in Bangladesh (where rising sea levels have induced migration to urban centres and across the border to India) as well as studies among pastoralists in northern Kenya (where increased migrations are a coping mechanism in periods of adverse environmental conditions, bringing different groups in greater competition over the same or dwindling resources). However, the form which conflicts may take will vary, and each form may be affected differently by climate change; cattle raiding, for example, seems to occur more frequently in the rainy season.[47] In sum, the relationship between different types of conflicts and climate change merits further investigation.[48]

A study commissioned by International Alert points out that, among the arguments for taking action against climate change, perhaps the most compelling are the potential security implications.[49] Yet there is a risk of over-

43 ICG (2010).
44 Saferworld (2008a).
45 BIISS & Saferworld (2009).
46 Saferworld (2008b).
47 CDC & IISD (2009); Saferworld (2009).
48 CDC et al. (2009).
49 Smith & Vivekananda (2009).

stating the conflict dimension in order to convince a lukewarm public – and the politicians who form their governments. Securitisation may also run the risk of promoting rapid and high-cost responses over more cost-effective and sustainable options. Yet the security dimension cannot be overlooked, as climate change is likely to place additional demands on institutions. Fragile states with weak governance structures may be least able to respond, meaning that climate change will further weaken confidence in the social order and erode the stability of these societies.[50]

It can also be argued that diminishing resources will hinder the capacity of states to respond effectively to the challenges posed by climate change. Saferworld's 2007 human security survey in Bangladesh[51] raised many areas of concern relating to the state's ability to provide basic 'freedom from want' (economic, food, health and environmental security), as well as with respect to the effectiveness of the state security sector to maintain peace and safeguard the population from the risk of crime and violence. As Bangladesh is likely to suffer severely from rising sea levels, additional strains will result.

From a conflict analysis perspective, climate change is not in itself a direct cause of conflict. Analysing how climate change will affect security and conflict dynamics is about understanding the "consequences of consequences".[52]

Looking back at the rapid rise of climate change among global priorities and as a security concern, it is clear that some official institutions as well as civil society groups are not averse to endorsing alarming scenarios. Exaggerations of the nature and intensity of the link between climate change and conflict may, in fact, increase the role of those who may be called to address the emerging risks. This may include some rather unexpected bedfellows, such as the military and some rather activist or left-leaning NGOs. If the maximalist view of climate change risks – with the spectre of an increase in the intensity, scope or frequency of disasters and conflicts triggered by climate change – was to form a basis for policy, this might add to the stature of these organisations, as well as to their ability to raise funds.

50 (ibid.).
51 Saferworld (2008b).
52 International Alert (2007).

F. Can Academic Research Clear the Mist?

Research on the relevance of environmental issues in the realm of security has pre-dated work on climate change. Throughout the 20th Century, a sizable body of literature has developed on the spatial dimension within which political decisions are made and implemented. Sustained and continually refined analyses from the 1930s to the 1970s by Harold and Margaret Sprout recognised the connections between the decision-maker, the "psychological milieu" (the perceived environment upon which the policymaker's reactions are based), and the "operational environment" – being the real world within which the policy is implemented.[53] This analysis is also relevant today with respect to climate security, where ideologically tinted perception addresses the void which science has – at least as yet – been unable to fill.

At its most basic level, climate change is beyond the reach of political processes. It is, however, impossible to separate 'external' or 'physical' changes from their effects, after they interact with other natural and human processes. Desertification is a case in point: while a reduction in amounts of precipitation is undoubtedly a factor, poor farming practices, overgrazing, deforestation, and poor governance relating to water and resources also contribute to advancing deserts.[54] In this sense, climate change aggravates other environmental and resource use problems and complicates the search for an appropriate human response.

In more general terms, climate shifts aggravate environmental stress which, in conjunction with other factors, may lead to violent conflict. However, environmental stress – manifested through different and often interlinked environmental scarcities – is not a direct cause of violent conflict. Hence, the burden of explanation is simply moved further down the causal chain.

Academic exploration of the link between climate change and violent conflict has been placed mainly within the broader context of how resource scarcity (demand-induced, supply-induced or structural) relates to violent conflict.[55] The physical impacts of climate change, such as: increase in temperature; change in seasonality and amount of rainfall; wind storms; sea-level rise; and increases in the frequency and severity of extreme weather events, e.g. drought and flooding, are likely to contribute toward reducing

53 Sprout & Sprout (1968).
54 Leroy (2009:1–7).
55 See e.g. Homer-Dixon (1999:47–49).

the quantity and quality of various renewable natural resources – thus generating supply-induced scarcity.

Various research efforts have attempted to clarify the pathways and processes through which these impacts – and the supply-induced scarcity they generate – lead to violent conflict. A frequently used method is to look for historical analogies to various effects of climate change – including drought, variability of precipitation, extreme weather events and ecologically induced migration – in order to assess whether these phenomena have in the past been correlated with the onset of violent conflict.[56]

However, findings on the links between climate change and conflict differ quite widely. A climate-change-induced decline in agricultural productivity could reduce the opportunity cost of fighting, thus making it more plausible to fight than to till one's land. Furthermore, increasing supply scarcity coupled with ecological marginalisation of the poor, and potential moves by elites to capture valuable resources, will worsen the economic welfare of the general population.[57] Such outcomes are likely to be exacerbated by pre-existing structural differences in access to resources and by property rights regimes, as well as by weak institutions and governance failures.[58]

Collier et al. single out migration and reduced flow volumes of international rivers as the major pathways to conflict.[59] However, previous studies on river basins have concluded that shared water resources promote international cooperation rather than conflict.[60]

For the northern hemisphere, the historical link between climate and conflict has been investigated rather thoroughly. Colder periods of the previous millennium – such as the Little Ice Age which peaked in Western Europe and China toward the middle of the 17th Century – were associated with declining agricultural productivity and increases in food prices, as well as societal tension and the increased likelihood of war. Colder climates also coincided with a higher incidence of war in both China and Europe, as well as with high depopulation rates.[61] Le Roy Ladurie also noted that excep-

56 Buhaug et al. (2010); Busby (2010).
57 Homer-Dixon (1999:177–180).
58 Leroy (2009:361–370).
59 Collier et al. (2008:337–353).
60 See e.g. Elhance (1999).
61 Zhang et al. (2006); Tol & Wagner (2010); Zhang et al. (2007).

tionally cold winters and poor growing seasons in the 1640s and 1650s were associated with social unrest in France and five other European states.[62]

Academic studies investigating the climate change–conflict nexus use climatic parameters as an independent variable and conflict data as a dependent variable. However, different studies use different parameters as climate change indicators: most use rainfall data,[63] while others use temperature[64] and the occurrence of El Niño events.[65] Even the group which uses rainfall does not use the same attributes of rainfall; for example, Miguel et al. used annual rainfall;[66] Levy et al. used the Weighted Anomaly Standardised Precipitation Index;[67] Hendrix and Glaser used standard deviations from the previous year's rainfall;[68] Hendrix and Salehyan used standardised rainfall deviation;[69] and Theisen et al. used meteorological drought as an independent variable.[70] This range of parameters complicates drawing conclusions which might advance the understanding of links between climate change and conflict.

Both reduction and increase in rainfall could lead to conflict. Dry extremes may lead to slow-onset conflict events, the social impacts of which will first be accentuated by migration and economic impacts. Wet extremes, specifically floods, usually result in the swift onset of conflict, due to their immediate destabilising impacts on lives and livelihoods as well as on social and physical infrastructure.[71] Within Africa, rainfall could show either positive or negative shifts due to climate change, depending on the specific geographic region under consideration, while temperature appears to be increasing continent-wide. For African agriculture, temperature increase is linked to a drop in productivity, in effect increasing conflict risk.[72]

Empirical studies report opposing findings at times: while some find a negative correlation between rainfall and conflict risk, others find a positive

62 Le Roy Ladurie (2005).
63 Hendrix & Glaser (2007); Hendrix & Salehyan (2012); Levy et al. (2005); Meier et al. (2007); Miguel et al. (2004); Smith (2012); Theisen et al. (2009).
64 Burke et al. (2009:20670–20674); Zhang et al. (2006, 2007).
65 Hsiang et al. (2011:438–441).
66 Miguel et al. (2004).
67 Levy et al. (2005).
68 Hendrix & Glaser (2007).
69 Hendrix & Salehyan (2012).
70 Theisen et al. (2009).
71 Smith (2012).
72 Burke et al. (2009).

association and still others do not seem to find a statistically significant correlation at all. For example, Miguel et al. found that, through its impact on economic growth, rainfall is strongly negatively correlated with the risk of civil conflict in Africa.[73] Levy et al. found that the onset of high-intensity conflict is strongly related with rainfall deviations, with a one-year lag.[74] Hendrix and Salehyan found that both negative and positive rainfall deviations increase the likelihood of social conflict, the correlation being strongest for positive deviations.[75] A similar finding of higher conflict likelihood in higher rainfall years is also found by Meier et al. in pastoral areas of the Horn of Africa,[76] and by Smith in the whole Horn of Africa region.[77] In pastoral areas, it makes more sense to steal fatter cattle. Moreover, taller grasses in the rainy season provide cover for the rustled livestock. Thus, cattle rustling and consequent pastoral conflict tend to be more common in higher rainfall years. Conversely, Theisen et al. did not find a statistically discernible increase in the risk of civil war in Africa in years experiencing meteorological drought.[78]

Burke et al. found temperature to be a more important determinant than rainfall in influencing the likelihood of conflict.[79] They further found that an increase of 1°C resulted in a 4.5% rise in the incidence of civil war in the same year, and a 0.9% rise the following year. Hsiang et al. found that the probability of new conflicts doubled in El Niño years relative to La Niña years in the tropics between 1950 and 2004, concluding that El Niño has contributed to 21% of all civil conflicts in that period.[80]

Kevane and Gray investigated the importance of climate change in the Darfur conflict, which has often been seen as a causal explanation by journalists and politicians.[81] They found that there had been no significant decline in annual rainfall in the years prior to the outbreak of large-scale con-

73 Miguel et al. (2004).
74 Levy et al. (2005).
75 Moreover, while other studies use the Armed Conflict Database from the International Peace Research Institute of Oslo and the University of Uppsala, Hendrix and Salehyan (2012) and Smith (2012) used the new Social Conflict in Africa Database from the University of Texas at Austin to generate their independent variable.
76 Meier et al. (2007).
77 Smith (2012).
78 Theisen et al. (2009).
79 Burke et al. (2009).
80 Hsiang et al. (2011).
81 Kevane & Gray (2008).

flict in 2003, although there had been a structural break to a lower mean in the early 1970s.[82]

Extreme weather events form one category of climate change that is often attributed to nature alone. Certainly, exceptional deluges like the events in Pakistan in July and August 2010 are bound to cause devastation. It is questionable, however, whether climate change alone is at the basis of an increase in their intensity or frequency. Urbanisation – leaving large areas paved over, thus essentially producing more run-off rather than absorbing moisture into the soil – as well as deforestation and poor land use practices no doubt amplified the dramatic course of events, aggravating the consequences for tens of millions of Pakistanis.[83]

G. Cause for Alarm?

Embarking on a critical analysis of the consequences of global warming requires more than scientific data. At least as important is an understanding of the analyst's perspective on how to approach facts and build understanding. This is by no means a straightforward exercise. We are operating in a multilogical world, in which there are many cultural differences and a rich variety of indigenous knowledge starting from differing premises.[84] Moreover, the globalisation of media flows has made it easier to spread authoritative and diverging views, while also exposing us to more sophisticated propaganda and deliberate distortions.

The observable phenomena that have given rise to the scientific concept of *climate change* are themselves difficult to grasp. Meteorology is a fickle science, with minute variations giving rise to very different outcomes in terms of weather prediction. Meteorological observations by Edward Lorenz formed a significant part in the formulation of chaos theory.[85] Furthermore, the locally observed outcomes of global climatic changes – both in measurable climate variations and in terms of the human response to them – are varied and defy neat categorisation.

Since there is a wide range of social and intellectual premises on which cultures base their responses to new challenges, the scope for identifying

82 (ibid.).
83 Homer-Dixon (2010).
84 Kincheloe (2007).
85 Lorenz (1963).

'standard' mechanisms of how societies adapt to climate change is reduced. In order to allow consideration of the full range of options, social debate and scientific research should not be constrained.

Nevertheless, in the social sciences – as well as in politics and the media – the scope of what is being debated and investigated is often limited through pressures to conform to the dominant creed. This tends to become a form of propaganda to maintain orthodoxy, frequently turning into censorship.[86]

It should also be acknowledged that scientists are not neutral and, however hard they may try, they cannot escape the ideological bent with which they embark on their work.[87] Ideological elements also infiltrate the funding processes for research projects. Donors want to be seen as supporting 'correct' lines of work, which do not run counter to prevailing thinking.

At the same time, researchers working on climate issues should be careful not to overstretch the significance of their data and findings. Whether in the social, physical or life sciences, modesty is an asset in research. Projections made to the second half of the 21st Century and beyond are rarely warranted. Indeed, given our inadequate understanding of current developments, and keeping in mind the perspectives of relativity and non-linearity, it is rather hazardous to move toward such a bold horizon.

Another element in the climate debate relates to the end of the Cold War, which has eased the way toward new power struggles – geographically as well institutionally, including the struggle for domination between the institutions of science, government, the military, and business. Claims of impending climate doom are at least in part a manifestation of this phenomenon.[88]

There is also an ideological element in alarmist statements coming from some scientists and politicians in developing countries, and the echo they receive from some Western NGOs, assigning guilt to the industrialised world as being responsible for yet further threats to their progress. While this may be true in a historical sense, GHG emissions are now far higher than they were a century ago, and they emanate increasingly from growing economies with a non-capitalist past.

Assigning blame and seeking retribution relates more to a struggle for power than to sound analysis about how to address climate-induced ills.

86 Herman & Chomsky (1988).

87 For a critique of the ideological element in demographic writings of the 1960s and 1970s, see Leroy (1981:737–743).

88 Hajer (1995).

While it is clear that the use of fossil fuels by the richer economies has tipped the scale in the global warming process, all nations will benefit from shifting development efforts toward renewable energy and conservation. However, international negotiations held in recent years, including Copenhagen, Cancun, Durban and Rio, have demonstrated that there is a continued strong ideological component in the debate on how to respond to climate change.[89]

H. Conclusion

Climate change does indeed have an impact on human security and conflict risk, in combination with other natural and man-made elements. However, governance is the strongest intermediate factor when it comes to explaining the link between environment and climate change on the one hand, and conflict on the other. Problematic land management decisions, for example, such as current trends to allot large tracts for mechanised farming or biofuel production, could endanger local ecosystems and might marginalise small farmers and pastoralists who use such land for grazing, besides placing additional demands on surface water and groundwater reserves. Undesirable outcomes of such practices should not be blamed on climate change.

If climate change is likely to have significant security ramifications, it would of course be important to devise an appropriate response to address these. However, the processes involved are poorly understood. Furthermore, climate scientists and those dealing with climate negotiations generally lack the expertise for taking account of the complex links between climate, development, governance and security. Politicians and climate experts rarely speak the same language; scientific findings, however accurate or widely accepted, will never dictate a specific approach and will always allow a wide range of policy responses. Perceptions, whether based on good climate science or on popular impressions, will continue to have an influence on the policies that are formulated.

Climate change is also likely to have economic consequences which will impose differential burdens – and benefits – on national economies. For example, most infrastructure has been built on the assumption that the physical environment will not change. However, rising sea levels may result in

89 Veening (2012).

increased flooding risks, such as for airports built near the coast. Permafrost is thawing in polar areas; in the Russian Federation, this is already resulting in the degradation of pipelines, railways and buildings, and complicating the transport of timber and minerals which were moved by truck over frozen land or over river and lake ice in winter periods in winter periods.

The impact of natural changes may be exacerbated by human action, such as the massive withdrawal of groundwater, which causes subsidence and will worsen the impact of rising sea levels. Large coastal cities such as Shanghai are particularly at risk: they are important population centres in which housing and productive capacity could be endangered in addition to infrastructure.

It should also be recognised that global warming will create advantages for some states. In Canada, for example, the northern limit of cultivated land may move up, allowing more grain to be produced; the same may happen to the boreal forests, expanding northward into what is currently tundra. Moreover, the thawing of polar ice is likely to result in shortening sea lanes, allowing cargo to be moved between northern Russia and the Far East through Arctic waters. Also, opening of the Northwest Passage through the Canadian Arctic would considerably lower costs and travel time for shipping between Europe and the Far East.

While academic studies offer rather convincing evidence that climate change has historically been associated with conflict in the northern hemisphere,[90] an analogy with the current episode of global warming may not be in order. Rapid and accelerating technological changes since the Industrial Revolution may offer additional avenues for absorbing societal and economic strains introduced by climate change. Coupled with appropriate measures to conserve resources and to complete the shift toward renewable energy, new technologies could go a long way toward reducing tensions associated with resource scarcities and further climatic shifts. Such an approach is admittedly more problematic for countries which face challenges in the fields of technology, ingenuity and creativity.

As it is not clear at this stage which responses might increase conflict or cooperation, addressing the security implications of climate change will require a multifaceted approach, with climate-sensitive development policies and strengthening of institutions, in order to facilitate the implementation of adaptive measures, ensure equitable access to stressed resources, and miti-

90 Tol & Wagner (2010); Zhang et al. (2007).

gate the impact of climate-induced resource scarcities and extreme weather events.

Migration is likely to increase as a response to environmental and climate changes. There is a definite potential for strain to be felt as a result, including ethnic tension and even international conflict. However, if migration can be channelled in a way which allows legal and political controls to prevent an overload in the receiving countries, international migration flows have the potential to mitigate negative impacts in countries which are likely to experience the most severe consequences of climate change. Remittances are already as important as official development assistance in transferring wealth from developed economies to least-developed countries.[91] Further increasing these flows may at least partly offset the unequal economic burdens imposed by climate change. International flows could also reduce the burden on cities in least-developed countries, which would otherwise be the primary destination of environmental migrants from rural areas suffering the consequences of climate change.

In the face of continually rising populations, food production is likely to be the main point of friction globally – including in Africa. New production techniques and shifts in the types of crops produced may bring partial relief for the ill effects of climate change, but there may be increased reliance on grain from a few 'breadbasket' nations.

By mitigating the factors that result in climate change, e.g. cutting the emission of GHGs in addition to carbon dioxide, substantial benefits could be yielded. For example, curbing short-lived GHGs such as hydrofluorocarbons and methane through existing technology could cut the rate of global warming substantially, making it more likely that global warming might be limited to below 2°C. Adding gases like methane to the Montreal Protocol, which was initially adopted in 1987 and has been amended several times since, would be the least cumbersome way to achieve this.[92]

It is clear that all sectors that are major consumers of energy can contribute to achieving climate change mitigation goals. The US military alone consumes US$25 billion worth of fuel annually; also, fuel costs make up 9% of expenses for UN peacekeeping operations. By embracing new technologies and applying renewable energy sources, the military could be part of the solution to climate-change-related problems, rather than potentially having

91 World Bank (2011).

92 Statement by Durwood Zaelke at the "Building Climate Change Institutions" Conference, European Parliament, Brussels, 21 March 2012.

to deal with the consequences. Initiatives such as the Military Green of the European Defence Agency are contributing to making this change.[93]

There is a wide range of possible responses for addressing the challenges raised by climate change. Concrete circumstances on the ground will differ by country and region; policies will need to be designed taking account of these variations. Cultural diversity may limit certain options while opening others; political systems and traditions will guide possible responses. Governance and institutional capabilities are always central to devising appropriate policy responses and ensuring their implementation. The ability of the various levels of government to manage and regulate access to natural resources can limit the ill effects of climate change and environmental degradation. In this sense, conflict over natural resources often reflects failing governance.[94]

Climate change and the food insecurity which may accompany it are likely to amplify tensions over land tenure as well as over access to water and land. Strong institutions and leadership should be able to manage those tensions, and should limit the consequences of drought, famine, extreme weather events, and conflict; weak governance worsens the outcomes. Approaches to land use which allow the bulk of the rural population to improve their living standards while staying put – such as through agro-forestry and short-cycle vegetable and fodder production – would appear to be a first line of defence.[95]

There is obviously room for more research on the security impacts of climate change. Increasingly, this work can be done in the field, assessing the consequences of real cases. Field studies should be based on good climate science, recording changes in climate indicators, and documenting their evolution for as long a period as weather records permit. Furthermore, an effort should be made to disaggregate the effects of climate change from those of other factors – such as population growth – which may result in resource constraints that produce impacts similar to those of climate change. Another complexity is added when one considers that climate change is unlikely to affect different occupational groups within the same region in the same way. Conclusions reached through studies regarding the involvement of pastoralists groups in conflict as a result of climate change are unlikely to have the same validity when applied to sedentary farmers or urban pop-

93 European Defence Agency (2012).
94 Leroy & Gebresenbet (2011:9–15).
95 (ibid.).

ulations in the same region. On balance, comparative and historical analyses will be needed in order to view the issues from a broader perspective. Jumping to conclusions will risk discrediting the many serious efforts that have been directed toward understanding these questions.

Intensifying efforts for research, analysis, monitoring and early warning will yield an exponential growth in our understanding of what is happening to global and local climates, and permit identifying policy options to address the consequences. Understanding how and to what extent environmental and climate changes contribute to security issues will also allow integrating environment, climate variability and natural resources into conflict prevention and peace-building strategies.

The above analysis brings out the rather rudimentary state of our understanding of the links between environment and climate change on the one hand, and security on the other. This underlines the need to approach further reflection with an open mind. Dogmas can only impede further research. Axioms and assumptions should always be stated up front. Ideologies are unavoidable in any social endeavour, and may be useful as guides for further work, but they should not obscure signals coming from other persuasions.

We alluded above to the tendency, in many human pursuits, to become dogmatic and to reject evidence which goes counter to the dominant creed. There is a risk of this evil being repeated in climate security research. If scholars limit themselves to reading and quoting a relatively small group of authors, a consensus may ensue quite easily – though it would be a rather incestuous one. It would be of greater value to conduct research on the social consequences of climate change in different cultural settings, and to benefit from the conclusions arrived at through different perspectives. African oral histories will shed light on human responses to climate fluctuations which have occurred on the continent over past centuries. These can provide clues about steering further scientific research. The writings of French historian Emmanuel Le Roy Ladurie give a detailed view of the impact of climatic changes on Western European history over the past millennium, based on solid analysis and meticulous work carried out over 50 years, though his work is rarely quoted.

Social psychology should also be applied in order to understand perceptions and their link to reality. After looking at literature which investigates links between climate change and violence, Harvard psychologist Steven Pinker agrees with those who are sceptical of the idea that people fight wars

over scarce resources and comments that "it is... foolish to let our lurid imaginations determine our sense of the probabilities."[96]

Applying critical views of how human thoughts take form and lead to apparent (though often erroneous) consensuses can add to our ability to grasp present developments regarding climate change and gain insights into what awaits future generations. We should resist the tendency to dig in and ignore work that is based on different premises than those we have become familiar with during our professional training.

Searching for ways of coping with climate change which are compatible with local culture and circumstances is a challenge that will need to be faced many times over. This effort will be successful only if it combines an open search for understanding with indigenous values and experience.

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96 Pinker (2011:376–377).

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