Climate Change, Human Security and Violent Conflict

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Climate change, human security and violent conflict

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Abstract

Climate change is increasingly been called a 'security' problem, and there has been speculation that climate change may increase the risk of violent conflict. This paper integrates three disparate but well-founded bodies of research – on the vulnerability of local places and social groups to climate change, on livelihoods and violent conflict, and the role of the state in development and peacemaking, to offer new insights into the relationships between climate change, human security, and violent conflict. It explains that climate change increasingly undermines human security in the present day, and will increasingly do so in the future, by reducing access to, and the quality of, natural resources that are important to sustain livelihoods. Climate change is also likely to undermine the capacity of states to provide the opportunities and services that help people to sustain their livelihoods. We argue that in certain circumstances these direct and indirect impacts of climate change on human security may in turn increase the risk of violent conflict. The paper then outlines the broad contours of a research programme to guide empirical investigations into the risks climate change poses to human security and peace.

Keywords: Climate change; Human security; Violent conflict; state functions

Introduction

There is now a significant body of research that demonstrates that climate change is and will increasingly have dramatic impacts on ecological and social systems (summarised in IPCC, 2001, 2007). The risks are such that the aim of the UN Framework Convention on Climate

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Change is to avoid 'dangerous' interference in the climate system, and such impacts have been defined as a threat to 'security' (Barnett, 2003; Barnett & Adger, 2003; Brown, 1989; Edwards, 1999; Swart, 1996). There has been some speculation about the ways that climate change may increase the risk of violent conflict (Brauch, 2002; Gleick, 1992; Homer-Dixon, 1991; van Ireland, Klaassen, Nierop, & van der Wusten, 1996). There are two broad ways in which conflict might be stimulated by climate change. First, conflict could come about through changes in the political economy of energy resources due to mitigative action to reduce emissions from fossil fuels (Rifkin, 2002). The second issue is the prospect of conflict stimulated by changes in social systems driven by actual or perceived climate impacts. This paper is concerned with the second of these possible connections. It offers new insights into the relationships between climate change, human security, and violent conflict by integrating three disparate but well-founded bodies of research – on the vulnerability of local places and social groups to climate change, on livelihoods and violent conflict, and the role of the state in development and peacemaking. Human security is taken here to mean the condition where people and communities have the capacity to manage stresses to their needs, rights, and values (after Alkire, 2003).

This paper has four principal sections. First, it explains that climate change may undermine human security by reducing access to, and the quality of, natural resources that are important to sustain livelihoods. Second, it suggests that the kinds of human insecurity that climate change may affect can in turn increase the risk of violent conflict. Third, it argues that climate change may undermine the capacity of states to act in ways that promote human security and peace. In sum, we suggest that, through direct effects on livelihoods and indirect effects on state functions, climate change may in certain circumstances increase the risk of violent conflict. Yet these connections between climate change, human security, the state and violent conflict are not empirically proven. Hence, we finally outline a research agenda to guide empirical investigations into the risks climate change poses to human security and peace.

Climate change and human security

There is now widespread agreement that the changes now underway in the earth's climate system have no precedent in the history of human civilization (IPCC, 2007; Stern, 2007). As a macro-driver of many kinds of environmental changes such as coastal erosion, declining precipitation and soil moisture, increased storm intensity, and species migration, climate change poses risks to human security (McCarthy, Canziani, Leary, Dokken, & White, 2001). In most parts of the world, the impacts of climate change on social–ecological systems will be experienced through both changes in mean conditions (such as temperature, sea-level, and annual precipitation) over long-time scales, but also through increases in the intensity and in some cases frequency of floods, droughts, storms and cyclones, fires, heatwaves, and epidemics. Outside of these short- and long-term changes, which are projected to occur with high levels of certainty, there also exist somewhat more unquantifiable risks of high-impact events. These include melting of glaciers and permafrost which may add several meters to global sea-levels, collapse of the thermohaline circulation which may cause significant regional climate changes in the northern hemisphere, and large scale shifts in the Asian monsoon and the El Nino Southern Oscillation phenomenon (Oppenheimer & Alley, 2004; Vellinga & Wood, 2007; Schneider, Semenov, & Patwardhan, 2007).

There is every reason to worry about the impacts of these changes on human systems given that the rate of change is unprecedented in the past 10,000 years, and that climatic variations have triggered large-scale social disruptions in the past. The association between El Nino

events and famines that killed tens of millions across the tropics in the late 19th century has been well documented by Davis (2001). Davis (2001) argues that famine was triggered by drought, but caused by the way political and economic colonisation deprived people of their entitlements to natural resources. Most analyses of famines now identify poverty, inequality, market failures, and policy failures as the deeper causes of what ostensibly seem to be 'natural' disasters (see Sen, 1981; de Waal, 1997; Webb & von Braun, 1994). Davis's arguments about the ways climatic variations have combined with stressed social–ecological systems to result in dramatic social change is reinforced by Diamond (2005), who examines many cases of catastrophic social change and finds that environmental change was a common factor in all of them, and climate change in particular was a cause of many.

The vulnerability (potential for loss) of people to climate change depends on the extent to which they are dependent on natural resources and ecosystem services, the extent to which the resources and services they rely on are sensitive to climate change, and their capacity to adapt to changes in these resources and services. In other words, the more people are dependent on climate sensitive forms of natural capital, and the less they rely on economic or social forms of capital, the more at risk they are from climate change.

Yet environmental change does not undermine human security in isolation from a broader range of social factors. These include, among other things, poverty, the degree of support (or conversely discrimination) communities receive from the state, their access to economic opportunities, the effectiveness of decision making processes, and the extent of social cohesion within and surrounding vulnerable groups. These factors determine people and communities' entitlements to economic and social capital that in turn determine their capacity to adapt to climate change so that the things that they value are not adversely affected.

The way climate change can and does undermine human security varies across the world because entitlements to natural resources and services vary across space, and the social determinants of adaptive capacity are similarly varied. For example, in contrast to many industrialised countries where agriculture represents 1–2% of the workforce, in East Timor some 85% of the population are dependent on agriculture as their sole or main source of income, and the majority of the population are engaged in subsistence farming so that 46% of rural people live below the poverty line of US$0.55 per day (UNDP, 2002). There is no state-directed system of income support, but there may be customary and Church-lead processes whereby food (and in some places labour) is shared. There is a modest public education system and a very basic public health system. Therefore, most rural Timorese have little or no alternative sources of food beyond their own production. Maize is the most important source of food supply, but nowhere is it an irrigated crop. Therefore, in times of low rainfall maize production can be reduced by up to one-third, resulting in widespread hunger and child malnutrition (Barnett, Dessai, & Jones, 2007). If climate change results in less rainfall in the dry season, then this may negatively affect a number of resources that rural Timorese value, such as sufficient food and good health. In Timor, as in most instances of famine risk, climate is an exogenous trigger, but underlying social problems are the deeper cause of food crises. This example of East Timor, as well as the aforementioned analyses of famine, strongly suggests that the risks of climate change to social systems is as much about the characteristics of those systems as it is about changes in environmental systems.

While the focus of human security is the individual, the processes that undermine or strengthen human security are often external to the locality of communities where individuals reside. In terms of environmental change, for example, upstream users of water, distant atmospheric polluters, multinational logging and mining companies, regional-scale climatic

processes, and a host of other distant actors and larger scale processes influence the security of individuals' entitlements to natural resources and services. Similarly, in terms of the social determinants of vulnerability, warfare, corruption, trade dependency, macroeconomic policies, and a host of other larger scale processes associated with 'globalisation' shape the social and economic entitlements that are necessary to reduce an individual's vulnerability (or increase their ability to adapt) to environmental changes. Adger and Kelly (1999) refer to these larger scale processes as comprising the 'architecture of entitlements'. Furthermore, the determinants of human security are as temporally as they are spatially complex: past processes such as colonisation and war shape present insecurities, and ongoing processes such as climate change and trade liberalisation shape future insecurities.

These larger scale processes that shape people's entitlements to natural, economic and social capital may themselves be vulnerable to climate change. Production sectors may be at risk; for example, it is not just farmers whose livelihoods are at risk from climate change, but also those whose livelihoods depend on agricultural production such as suppliers of inputs, people who work in transporting and processing agricultural commodities, people who work as extension officers, and people who work in agricultural lending services. The knock-on effects of the decline of certain sectors and the responses of those who depend on them for their livelihoods may in turn impact on other places; for example, rural decline can cause migration to urban areas, placing increasing demand on urban services and increasing political pressure on the state, which in itself is an important provider of various entitlements such as education, health care, law and order, credit, and protective security (see below).

The extent to which system-wide impacts transpire will be determined in part by the degree to which any given national economy is dependent on climate sensitive natural resources, and the robustness and resilience of social institutions to manage change. In both these less direct ways, but also through direct processes such as territorial losses through rising sea levels, climate change may be a national security issue (Barnett, 2003). The risk to national security may be both a cause and a consequence of human insecurity.

So, human security is a function of multiple processes operating across space, over time, and at multiple scales. This makes researching the ways in which climate change may affect human security a daunting task, which is not helped by the difficulty of ascertaining whether there are indeed any existing environmental changes that can be attributed to climate change (see Allen & Lord, 2004). Nevertheless, there have been some investigations of the relationship between climate change and human security. These have focussed on the local dynamics that limit individuals' and group's access to environmental, financial, and social resources necessary to respond to climate variability and change (e.g., Adger, 1999; Bohle, Downing, & Watts, 1994; Liechenko & O'Brien, 2002). As well as these climate specific applications, a similar social vulnerability approach has been applied in anthropology (e.g., Minnegal & Dwyer, 2000), development (e.g., Chambers, 1989) and disasters research (e.g., Blaikie, Cannon, Davies, & Wisner, 1994). In the field of environmental security many case studies, for example from Northern Pakistan (Matthew, 2001), South Asia (Najam, 2003), the Niger Delta (Mochizuki, 2004), the Pacific Islands (Cocklin & Keen, 2000) and Ethiopia (Haile, 2004) show that environmental change can be a significant factor that undermines human security. This research demonstrates that marginalised people are vulnerable to environmental change, and it all helps substantiate the argument that climate change poses significant risks to human security in many parts of the world. What is less clear, however, are the ways in which human insecurity lead to violent conflict. This is important to consider since violent conflict is itself a powerful cause of human insecurity and vulnerability to climate change (Barnett, 2006).

Human insecurity and violent conflict

Beyond considering the impact of violent conflict on people, for the most part the issues of human security and violent conflict are treated as separate entities in research. Instead, most research into the cause of violent conflicts, including that from almost all participants in the so-called 'greed versus grievance' debate (see Berdal & Malone, 2000), focus on the structural conditions that increase the risk of violent conflict rather than the decisions of actors to engage in violent acts. Yet violence happens for a number of reasons including, because leaders are more able to mobilise some groups of people under certain conditions such as the presence of a weak state (Eckstein & Gurr, 1975); because of the 'lootability' of natural resources (Collier, 2000); and because to varying degrees individuals *choose* to engage in both violence (excluding those who are forcibly conscripted into armed groups) and peace (Cramer, 2002; Gilgan, 2001; Moran & Pitcher, 2004).

The role of individuals in initiating, sustaining, resisting or solving violent conflicts is a major lacunae in both the development and violent conflict literature, and the environmental change and violent conflict literatures (in the latter more so than the former). There are few studies (Gough, 2002; Mochizuki, 2004; Ohlsson, 2000) that explain in any detail the ways in which human insecurity increases the risk of violent conflict. This section explores in detail the connections between human insecurity and the risk of violent conflict.

Table 1 summarises some our key hypothesised mechanisms by which climate change may undermine human security and may, in conjunction with an array of non-climate specific

Table 1
The relationship between determinants of human insecurity, violent conflict and climate change

Factors affecting violent conflict	Processes which climate change could affect/exacerbate
Vulnerable livelihoods	Climate change is likely to cause widespread impacts on water availability, coastal regions, agriculture, extreme events and diseases. The impacts on livelihoods will be more significant in sectors of the population with high resource-dependency, and in more environmentally and socially marginalised areas. Some of these climate driven outcomes are long term and chronic (such as declining productivity of agricultural land), while others are episodic (such as floods). These impacts on livelihoods will be widespread both in developing and developed countries.
Poverty (relative/chronic/transitory)	Poverty (and particularly relative deprivation) is affected by the spatial differentiation of climate impacts and the sensitivity of places to them. Climate change may directly increase absolute, relative, and transient poverty by undermining access to natural capital. It may indirectly increase poverty through its effects on resource sectors and the ability of governments to provide social safety nets. Stresses from climate change will differentially affect those made vulnerable by political-economic processes such as liberalisation of markets for agricultural commodities.
Weak states	The impacts of climate change are likely to increase the costs of providing public infrastructure such as water resources, and services such as education, and may decrease government revenues. So climate change may decrease the ability of states to create opportunities and provide important freedoms for citizens as well as decrease the capacity of government agencies to adapt and respond to climate change itself.
Migration	Migration may be one response of people whose livelihoods are undermined by climate change. However, climate is unlikely to be the sole, or even the most important 'push' factor in migration decisions. Yet large-scale movements of people may increase the risk of conflict in host communities.

factors, increase the risk of violent conflict. It is important to stress that climate change will not undermine human security or increase the risk of violent conflict in isolation from other important social factors. So, while Table 1 summarises our arguments, it should not be read as a simple statement of the ways climate change can be a security problem, nor as a blueprint for reductionist research. We also stress that the set of climate change factors does not cause violent conflict, but rather merely affect the parameters that are sometimes important in generating violent conflict. We examine each of these areas in turn.

A common factor in many internal wars is that armed groups are comprised of young men whose expectations for a better life have been frustrated due to contractions in their livelihoods (Ohlsson, 2000). This makes joining an armed group a relatively more rational option to achieve some status in society, particularly when leaders are able to ascribe their poverty to the actions of Other (ethnic, political, geographic, class) groups (Goodhand, 2003; Reno, 1997). Ohlsson (2000: 8) juxtaposes the situation of declining livelihoods with a more stable state of affairs, arguing that ''young men do not (at least not in significant numbers) regularly seek immediate rewards in illegal activities and looting, as long as the society they live in can provide livelihoods and a social position''. Indeed, poor men may have a 'comparative advantage' in violence because the opportunity costs of joining armed groups are low (Goodhand, 2003). The opportunity costs for women, in contrast, are relatively higher; their reproductive and domestic obligations arguably mean they are less likely to engage in acts of organised violence because this would mean forsaking those who may be dependent on them (Ohlsson, 2000). The gendered division of labour in most countries also makes women the first to suffer from the direct and indirect depredations wrought by violent conflict (Brittain, 2003). Perhaps for these reasons, women are often the most important actors in peace-building endeavours (Mochizuki, 2004; Moran & Pitcher, 2004).

A number of authors (Goodhand, 2003; Nafziger & Auvinen, 2002; Ohlsson, 2000) hypothesise that it is not so much chronic poverty *per se*, but rather the risk or realisation of sudden poverty that increases people's propensity to join armed groups. Stewart and Fitzgerald (2000) point to uncertainty about the future as being a critical factor here, and in this sense it is not just potential or actual insecurity that increases the risk of violent conflict, but also the perception of future insecurity (uncertainty). In this respect, the provision of aid, and importantly some certainty that aid will arrive, can help reduce the need for people to use violence to provide for their needs (Gough, 2002; Keen, 2000). In many developed countries, established and effective welfare systems perform this function, which in part helps explain why they experience relatively less frequent and intense violent conflicts than developing countries.

The causes of livelihood contraction are often but not exclusively due to declining access to natural capital caused by, for example, deforestation, land degradation, natural disasters such as drought and flood, and population displacement for agricultural expansion, industrial development, or the building of roads and dams. Declining access to land, or rather to the returns from human uses of land, is seen as a key process that causes livelihood contraction and hence increases the risk that people will join armed groups (de Soysa, Gleditsch, Gibson, & Sollenberg, 1999). Other non-ecological factors such as the rolling back of state services and declining terms of trade also matter, and often interact with natural resource use and people's access to them in complex ways (Reed, 1996). For example, in his analysis of land invasions in a district of Chiapas, Bobrow-Strain (2001) shows that declining agricultural production due to economic and political forces (rather than environmental scarcity) was an important factor in land conflicts. Population growth may be a contributing factor in declining livelihoods, but it is rarely the most significant (Hartmann, 1998). War itself is a significant cause of livelihood contraction: violence tends to escalate

in part because it generates new causes of grievance and increased impoverishment (Bax, 2002). These factors rarely operate in isolation (O'Lear, 2005). As argued earlier, there are good grounds to suggest that climate change will result in contracted livelihoods for many people, including losses of land and declining returns from human uses of land.

There is no consensus on whether income inequality causes violent internal conflict. Collier (2000) finds no strong association between income inequality and civil wars. However, many others argue that either vertical (class-based), horizontal (spatially-based), or age-based inequalities are a cause of grievance which leads to either direct action to redress inequality and/or to take revenge, or at least makes it possible for leaders to mobilise the poor under the common cause of grievance (Archibald & Richards, 2002; Cramer, 2003; Goodhand, 2003; Hage, 2003; Keen, 2000; Reno, 1997; Stewart, 2000). It is relative rather more than absolute poverty that seems to matter. Because contractions in the livelihoods of some sections of society most often imply increasing inequality (since others are not affected, or may indeed prosper), then this can create conditions more conducive to the outbreak of violence.

It is not just relative, absolute, and transient poverty that can increase the risk of violent conflict, but also a lack of opportunities for individuals and groups to act to improve their lives. Of particular importance here is access to education since it is critical for self-empowerment and increasing the prospects of employment, higher wages, and social mobility. Education offers the opportunity for people to improve their lives. Poverty of opportunities has been seen to be a major factor in the decisions of people – particularly young men – to join militias in Sierra Leone (Archibald & Richards, 2002; Keen, 2000) and Palestine (Hage, 2003), and street gangs in Managua (Maclure & Sotelo, 2004).

This focus on agents' decisions reinforces the arguments of Collier (2000), Duffield (2001), Keen (2000) and Reno (1997) that wars are not irrational, but rather are the product of a set of rational decisions that lead to (a violent) reordering of economic and political systems and social relations. However, there are serious limitations to understanding agents only as rational economic actors (Cramer, 2002). Joining armed gangs can serve a host of psycho-social needs as well. It can deliver an often badly needed sense of power and status (Goodhand, 2003; Keen, 2000), the prospects of some social mobility (Stewart & Fitzgerald, 2000), excitement (Keen, 2000), and belonging and social recognition (Hage, 2003; Maclure & Sotelo, 2004). It may also be motivated by a genuine sense of grievance, frustration, and desire for revenge (Archibald & Richards, 2002; Scheper-Hughes, 2004), by identification with a common cause (Weinstein, 2004), and by a need for protection from violence and denial of economic freedoms (Keen, 2000; Mwanasali, 2000; Weinstein, 2004). 'Generation gaps' between youth and elders can also be a source of frustration and alienation, pointing to the need for inclusive decision-making and conflict resolution processes (Archibald & Richards, 2002; Reno, 1997). Once in a violent group, the *doing* of violence may be in part because of obedience to authority (Milgram, 2004), fear of exclusion from the group, a variety of 'cultural' factors (Hinton, 2004), and in large part due to training within armed groups and discursive processes that construct and dehumanise Others (Spillmann & Spillmann, 1991; Weinstein, 2004).

The meaning of violence also matters, as do perceptions of threat and danger (Goodhand, 2003). Not unlike the security dilemma whereby countries arm themselves because they perceive dangers from other countries, sometimes leading to iterative cycles of threat perception and armament (arms races), within countries groups may respond to perceptions of threat from others, leading to similar build up of threat perception and capability thereby increasing the risk of violent conflagrations. The role of leaders in generating or mitigating these cycles of antipathy is critical (David, 1997).

So, on the basis of the arguments and evidence we have just reviewed, it seems that human insecurity increases the risk of violent conflict. There is no single explanation for *why* individuals and groups who are – or who may or do become – insecure are more likely to join armed groups and engage in violent acts. This should not be surprising, for if violence were monocausal, solutions would be more readily identifiable. However, while the connection between human insecurity and an increased risk of violent conflict seems reasonably strong, this is not by any means to suggest that: (a) the presence of widespread human insecurity, even when coupled with every other possible risk factor, means violence is more likely than not; (b) over history the majority of directly violent acts that have caused trauma and death have been committed by the poor; (c) the forms of structural violence (see Galtung, 1969) that are the major cause of morbidity and mortality emanate from the decisions and actions of the poor; and (d) violent conflicts in developing countries are entirely local and caused exclusively by endogenous factors. It does suggest, however, that under certain circumstances, at the same time as it negatively affects human security, climate change may also increase the risk of violent conflict. Livelihood security seems to be an important factor in security from violence, or, in Gough's (2002: 154) words: ''human security depends on a system where each rational individual calculates that it is more profitable not to rebel''. We now turn to discuss some of the larger structural circumstances – in particular, the operation of states – that both shape the degree of human security as well as affect the risk of violent conflict, and the ways some of these may be affected by climate change.

The state and human security

Human security cannot be separated from the operation of states. States are critical to providing opportunities for people, creating and providing a stable environment so that livelihoods can be pursued with confidence, and providing measures to protect people when livelihoods contract. They can actively promote or repress rights to personal security, social services, and economic opportunities. They can exercise their sovereign rights to mediate between global flows in ways that enhance or undermine all or certain groups' livelihoods. So the state is a critical institution for livelihoods. Yet given that few, if any violent conflicts are entirely local, and that most often there are important regional and global forces at work (such as arms trading, the presence of private security forces, cross-border movements of people and goods, foreign investors, and degrees of third party intervention), many states may be involved in the causes of and solutions to violent conflict (Kahl, 2006; Reno, 2000).

States play critical roles in creating the conditions whereby people can act in ways to pursue the lives they value (Sen, 1999). They can provide protective guarantees to assist people when their livelihoods suddenly contract, for example through income support, food aid, or short-term local employment programs. They can provide economic freedoms that are important for people to seek employment and to interact to seek mutually advantageous outcomes in terms of consumption and production. The state can provide political freedoms such as the freedom of speech, freedom of the media, civil liberties, and the freedom to vote for parties, leaders and policies. Provision of social opportunities such as education and health care is another important state role. States can provide transparency guarantees to ensure openness and accountability in transactions to mitigate against corruption and to maintain faith in market processes. These state functions are interconnected, they ''supplement'' and ''reinforce'' each other (Sen, 1999: 40), and their instrumentality is maximised when all are in place. When all these functions are extensive and effective states are legitimate, people have opportunities to develop and

have less anxiety about the future, conflict resolution mechanisms tend to be effective, and economies tend to grow and poverty levels tend to fall (Sen, 1999). These are characteristics of 'strong states' that have effective administrative hierarchies, control the legitimate use of force, can mediate impending conflicts before they turn violent, and are more capable of managing environmental degradation and change (Eckstein & Gurr, 1975; Esty et al., 1999; Hauge & Ellingsen, 2001; Kahl, 2006). In strong liberal-democratic states, both the structural conditions and livelihood factors that increase the risk of violent conflict are reduced.

When states cannot provide all these functions, the risk of violent conflict increases. Thus internal wars are more likely in countries where the revenue raising opportunities for the state are constrained (which is itself a function of the poverty of the population) (Nafziger & Auvinen, 2002). In a recent analysis, Kahl (2006) has argued that in addition to civil disputes arising when political leaders seek to exploit environmental and social pressures for personal gain, environmental change can be a factor in state failures through its impacts on revenue, legitimacy and social cohesion. A number of studies suggest that state functions that seem to be of particular importance to mitigate against the generation of violent conflicts include the provision of health care and education, the protection of human rights, establishment and maintenance of a strong and independent judiciary, accountable and transparent police services and armed forces, and the protection of democratic processes (Goodhand, 2003; Gough, 2002; Kahl, 2006; Keen, 2000). Democracy, for example, gives people power to act to affect change – it creates opportunities that reduce the need for violent action to cause change, and it tends to ensure a minimal level of welfare such that people are less likely to die from, for example, famine (Sen, 1999). For these reasons, groups that fall outside of – or who live beyond the protection of – the state, for reasons of geographic but also social distance, are often more likely to experience violent conflict (Keen, 2000). Goodhand (2003) points to the emergence of many violent conflicts in ecologically and/or economically marginal regions as evidence that relative poverty and poverty of opportunities due to inadequate access to the state may be a key cause of violence. Bax's (2002) detailed description of the emergence of violent conflict in a Bosnian village shows that contraction of the state and the economy heightened perceptions of inequality within the village, which lead to a progressive reduction of a previously pluralistic community into two groups who respectively dehumanised, and ultimately began killing each other.

Of course, where states actively deny entitlements, or deliberately repress and abuse people, violence becomes a more likely tool of resistance (Nafziger & Auvinen, 2002). There can be distinct environmental factors in this process, for example dispossession of land for mining with subsequent environmental impacts and inadequate returns to landholders was a key factor in the formation of the Bougainville Revolutionary Army (Böge, 1999); and inadequate distribution of the returns from resource extraction activities has been a factor in violence in West Kalimantan (Peluso & Harwell, 2001) and the Niger Delta (Mochizuki, 2004; Watts, 2001).

There are good grounds to think that when states contract – for example as a consequence of Structural Adjustment and Good Governance Programmes – so that the freedoms and opportunities they provide subsequently contract, violent conflict is more likely (Bax, 2002; Bobrow-Strain, 2001; Gough, 2002; Gourevitch, 1998; Kahl, 2006; Keen, 2000; Reno, 1997). So, understanding the way climate change may increase the risk of violent conflict therefore also requires understanding the way it may weaken (or strengthen) the capacity of states to provide or deny opportunities for people, and manage globalisation.

Other factors that increase the risk of violent conflict include the availability of weapons (Boutwell & Klare, 1999); a history of violent conflict (Collier, 2000); resource dependence

(de Soysa, 2000); a 'youth bulge' among the working population (Cincotta, 2004); and in-migration. In terms of migration, the influx of migrants into new areas has been a significant factor in many 'environmental conflicts' (see Baechler, 1999; Klötzli, 1994; Peluso & Harwell, 2001; Swain, 1993). Large migrations have at times lead to violent conflict, and large migrations may be a consequence of climate change (van Ireland et al., 1996). However, it is the political and institutional responses to new migrants – rather than the existence of migrants *per se* – that seems to be most important in cases where migration is a factor in violent conflict (Goldstone, 2001), and these social dynamics of host communities are important areas for study. Further, people rarely migrate for environmental reasons alone, so understanding the way climate change may induce more migration also requires understanding the way it will interact with other factors (Meze-Hausken, 2000). It also requires understanding the strategies people use to adapt to environmental changes, of which temporary, and ultimately permanent migration is but one (Davies, 1996; Meze-Hausken, 2000).

Despite the evidence that contraction in livelihoods, poverty (chronic, transitory, and relative), weak states, and immigration are all risk factors in violent conflict, and despite research that suggests that climate change may have direct and indirect negative effects on these risk factors, there is still much uncertainty about the ways in which climate change may increase human insecurity and the risk of violent conflict. Given this uncertainty, there are dangers in speaking prematurely and vociferously about climate change in the language of security (see Barnett, 2003). Much more research is required, and so we now turn to outline a potential research programme to gain a greater understanding of the ways climate change may increase insecurity.

Towards an improved understanding

The discussion in the sections above raises many questions that, to date, have not been effectively addressed by either theoretical or empirical research. We suggest that research on climate change and its potential effects on human security has many parallels with research on the risks and causes of violent conflict. Bearing this in mind, and informed by the discussion thus far, we now propose three key areas of research on climate insecurity, some of the important issues associated with each aim, and suggest some places where such research might profitably focus.

A key aim of research to enhance understanding of climate insecurity should be to assess the vulnerability of people's livelihoods to climate change. Studies of this kind are not new, but given that there are many low-income and resource dependent communities in the developing world such studies need to be far more numerous, both for reasons of enhanced understanding of the relative significance of factors that structure vulnerability, and to inform policies to reduce vulnerability to climate change. The Assessment of Impacts and Adaptations to Climate Change (AIACC) project is an initial attempt at the kind of comparative vulnerability assessment process that is required to enhance understanding and improve policies to address climate insecurity. The AIACC project is revealing that the most potentially devastating impacts of climate change arise from a combination of multiple stresses acting in concert – of which climate stresses are but one, and which also include ecosystem degradation, failed governance systems, and economic decline (Leary et al., 2006) The emerging lessons from this and other vulnerability research are, for example, that elderly and young people are particularly at risk everywhere in the world – in the developing world from impacts on agriculture and nutrition, and everywhere from the physiological impacts of heatwaves and extreme weather. Some places

are more exposed to new risk than others. But a starting point for security-oriented vulnerability research could be places where exposure is high and climate change seems to be having the greatest effect – notably the semi-arid tropics and the high arctic – and in places where the magnitude of impacts seems likely to be greatest, for example small island developing states and densely populated coastal areas such as the Ganges–Brahmaputra delta.

Present research on vulnerability to climate change investigates the diverse array of social and environmental factors operating over time, and across an array of spatial scales, that structure vulnerability (e.g., O'Brien et al., 2004). These factors include the sensitivity of resources such as freshwater, soils, reefs and fisheries to sudden and incremental changes in climate, the degree to which households and communities rely on these resources to meet their needs and values, and the capacity of social systems to adapt to changes in the temporal distribution and abundance of these resources so that households' and communities' needs and values can continue to be satisfied. This adaptive capacity depends on, *inter alia*, the ability to access commodity markets and labour markets and the prices paid on these markets, the ability of communities to pool resources to collectively respond to change, access to information, population health, and the existence and effectiveness of national and international policies and measures to sustain resources and livelihoods in vulnerable places.

Understanding the determinants of vulnerability in this way requires insights from a range of disciplines across the natural and social sciences. It also requires analysis of how policy agendas are shaped through science–policy interactions that can, at times, reproduce Malthusian associations of resource scarcity with the risk of violent conflict (Sarewitz, Pielke, & Keykhah, 2003). If the economically and politically powerful developed countries that also emit large amounts of greenhouse gases primarily understand vulnerability to climate change in developing countries as a risk to their national security through migration or violent conflict, then their responses may be more weighted towards increased border protection and defence spending, rather than towards the reduction of emissions and efforts to foster adaptation (Barnett, 2003). Hence, the framing of climate change risks by the scientific community, and the way those framings inform policy, is a key area for research (e.g., Weber, 2006).

A second key aim of the research to enhance understanding of climate insecurity should be to examine the consequences of livelihood insecurity, since this is a likely outcome of climate change, and seems to be a factor that increases the risk of violent conflict. Satisfying this aim in part requires answering a question at the heart of most conflict research, which is 'why do individuals choose violence?' – the answer to which is most likely to come through psychological rather more than geographic research. However, there are structural risk factors that can also be identified, and identification of these, the way they interact, and their influence on conflict is an important research task. Key risk factors include the opportunities to gain income elsewhere (which is most often a function of labour markets, and may involve migration), a past history of violence, ineffective justice systems, the availability of weapons, ineffective or non-existent public and private welfare systems, and poor access to opportunity-enhancing services such as education and health care.

A systematic and comparative research project on the consequences of livelihood change and the risk of violent outcomes would perhaps profitably focus on countries where the risk factors are high. The kinds of places where climate induced changes in livelihoods is a risk factor for violent conflict include those where the state is weak – as might be indicated by the Failed States Index (see Foreign Policy and the Fund for Peace, 2006); where access to education and health care and income is poor – as might be indicated by the Human Development Index (see UNDP, 2006); and where much of the population is dependent on primary resources

for their livelihoods – as might be indicated by sectoral distribution of employment data provided by the ILO (2005). Using these criteria as a course screen, the kinds of countries where climate change seems most likely to induce widespread human insecurity and conflict are those which score poorly on each of these indicators, and these include Chad, Cote d'Ivoire, The Democratic Republic of Congo, Haiti, Sierra Leone, Sudan, and Yemen. Within these countries, local level studies of low-income resource dependent communities, as well as low-income urban communities, could deliver insights into the ways people construct their livelihoods, the choices they have made when faced with change in the past, and the choices people are likely to make in the face of livelihood decline. They could also examine local peace movements and their successes and constraints.

In the two research priorities above, vulnerability analysis and causes of conflict analysis primarily focus on specific individual and community-level social processes, but with an eye on larger scale forces that shape the opportunities and constraints to local livelihoods and alternatives to them. But we argue that there is a third locus of analysis that is important for understanding climate security, and which is equally under-researched. The role of institutions, which is critical for successful adaptation to climate change (Smit & Pilifosova, 2001), as well as the management of security problems, including conflict (Keohane, 1989), is not well understood. The term 'institutions' is contested, but is understood here to be ''a persistent, reasonably predictable arrangement, law, process, custom or organisation structuring aspects of the political, social, cultural or economic transactions and relationships in a society'' (Dovers, 2001: 5). They are the ritualised practices that maintain social cohesion and collective and peaceful responses to changes. They include, but are more than, organizations and regimes, and they occur at various scales ranging from marriage to the United Nations.

There is no single agreed theory of institutional adaptation, nor are there clear criteria for what constitutes an 'effective' or a 'successful' institution (Adger, 2000). There is an emerging consensus, however, that a number of factors matter, including an institution's legitimacy (moral and legal), its responsiveness to its constituents, its core values and its commitment to them, its ability to learn and experiment, the amount of resources available to it, its independence from short-term political pressures, the quality of its management, and the transparency of its decision making (Dovers, 2001; Goodin, 1996). There are multiple and overlapping institutions operating at various scales that are and will be directly and indirectly involved in exacerbating or alleviating the adverse effects of climate change. These include local, national, regional and global governance institutions that make decisions and implement policies that directly (e.g., the United Nations Framework Convention on Climate Change), and indirectly (e.g., development agencies) affect capacity to adapt to climate change. An important task for research on climate change and security is therefore to identify the capacity of these institutions to manage the adverse effects of climate change so that they do not become security problems. Not all of these are amenable to empirical research, but the operation of the most important larger scale institution – the state – can be studied, and should be in the context of research to satisfy the first two and the following key aim for further research on climate insecurity.

Because the role of the state is often critical in reducing both vulnerability to climate change and the risk of violent conflict, and because the capacity of states is itself at risk from climate change, a third key aim of the research to enhance understanding of climate insecurity should be to examine the challenges climate change pose to states, including the capacity of the states to protect livelihoods and sustain peace, recognising of course that these may not be goals of some states. Key issues here are the dependence of states on revenues gained directly (as rents

or as state companies) or indirectly (through climate sensitive resources such as agriculture, fisheries, or forestry), and their responses to past situations where revenues have declined, which may include encouraging more intensive resource extraction, and declining expenditure on livelihood protection and peace building activities. Various state institutions are involved in managing the security risks of climate change. These include climate-specific groups such as national climate change teams and environment and resource management agencies. However, institutions engaged in management of problems that may arise from climate change such as increased rural–urban migration (land tenure institutions and urban planning agencies); increased morbidity (health service providers); increased climatic hazards (disaster management arrangements); increased demand for development assistance (diplomatic and development agencies); and increased violent disputes and crime (the judiciary and the police) are also important.

Because many of the determinants of vulnerability are either locally or state-derived, it makes sense to study state processes in the same countries that local-scale fieldwork is being conducted. That many important global processes such as development programs, trade and financial flows, and multilateral negotiations (on climate change, but also human rights, security, trade, and so on) flow through states add to the value of studying the state to understand climate change and security.

Conclusions

This paper has argued that climate change undermines human security in the present day, and will increasingly do so in the future. It does this by reducing people's access to natural resources that are important to sustain their livelihoods. Climate change is also likely to undermine the capacity of states to provide the opportunities and services that help people to sustain their livelihoods, and which help to maintain and build peace. In certain circumstances, these direct and indirect impacts of climate change on human security and the state may in turn increase the risk of violent conflict.

It seems evident that climate change poses risk to human insecurity principally through its potentially negative effects on people's well-being. This is the *a priori* reason why climate change is of great concern to many people. Yet there is need for considerably more research on the ways it may undermine human security, not least because the level of understanding of people's vulnerability is still sufficiently uncertain for the purposes of designing effective adaptation strategies. Yet, because the actual or perceived insecurity of people due to a wide range of processes – including livelihood contraction – is a factor in many violent conflicts, human insecurity caused in part by climate change may in turn lead to more conventional security problems.

Based on these observations, we suggest that there is a need for systematic, comparative and cross-scale research to enhance understanding of the connections between climate change, human security and violence. This includes understanding the ways in which it may affect environmental changes in localities, the extent to which people are susceptible to damage from those changes, and their capacities to avoid or adapt to them so that their livelihoods can be sustained and their needs and values can continue to be satisfied. It also requires understanding the ways in which people may respond if climate change undermines livelihoods, as one outcome might be an increased propensity for people to engage in violence as an alternative livelihood strategy. Finally, enhanced understanding of climate insecurity also involves understanding the ways in which climate change challenges states, including their capacity to protect livelihoods and maintain peace,

if it exists. Such research on climate insecurity can reduce uncertainty about the human dimensions of climate impacts, and enhance knowledge of potential adaptation strategies to avoid human insecurity as well as an increased risk of violent conflict.

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