Security and climate change

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Abstract

Despite it being the most studied and arguably most profound of global environmental change problems, there is relatively little research that explores climate change as a security issue. This paper systematically explores the range of possible connections between climate change and security, including national security considerations, human security concerns, military roles, and a discussion of the widely held assumption that climate change may trigger violent conflict. The paper explains the ways in which climate change is a security issue. It includes in its discussion issues to do with both mitigation and adaptation of climate change.
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1. Introduction: delimiting security

That environmental problems can become security problems is now well recognised in policy, including United States foreign policy. Surprisingly, despite climate change being the most prominent and best-studied of the suite of environmental change problems, it has thus far received little systematic analysis as a security issue (for partial connections see Brown, 1989; Edwards, 1999; Rahman, 1999; Swart, 1996; van Ireland et al., 1996; Wilson, 1983). This paper systematically explores the range of possible connections between climate change and security, including national security considerations, human security concerns, military roles, and a discussion of the widely held assumption that climate change may trigger violent conflict. The paper explains the ways in which climate change is a security issue. It includes in its discussion issues to do with both mitigation and adaptation of climate change.

'Security' in a general sense is the condition of being protected from or not exposed to danger. It has historically been concerned with safety and certainty from contingency (Dower, 1995). Thus Soroos (1997) defines security as "the assurance people have that they will continue to enjoy those things that are most important to their survival and well-being" (p. 236). Depending on *who* is to be secured, and *how* environ-

mental change—and what sorts of changes—threatens them, environmental change can be considered as a security issue. However, a question as fundamental as 'which environmental problems can be considered security issues?' has vexed environmental security scholarship (Barnett and Dovers, 2001; Shaw, 1996).

Following this definition of security, climate change is a security issue for some nation-states, communities and individuals. It is a problem that is complex in origin and has uncertain impacts. In the case of atoll-countries such as Tuvalu or Kiribati, for example, there is widespread agreement that climate change and associated sea-level rise threatens the long-term ability of people to remain living on their islands (Barnett and Adger, 2001; Nurse and Sem, 2001; Rahman, 1999; Watson, 2000). In this respect it is the most serious form of environmental change and the most serious security problem that these countries face. The President of the Federated States of Micronesia has put this bluntly: "sea-level rise and other related consequences of climate change are grave security threats to our very existence as homelands and nation-states." (Falcam, 2001).

It is not just small island states which face climate related security risks. It poses significant risks to the livelihoods, culture and health of many millions of people in many different social and ecological and contexts; consider Inuit communities living in the Arctic circle where snow cover is less predictable and thinner ice sheets restricts hunting, families living on low-lying deltas in Bangladesh increasingly prone to flooding, and people living in areas prone to invasion by malaria

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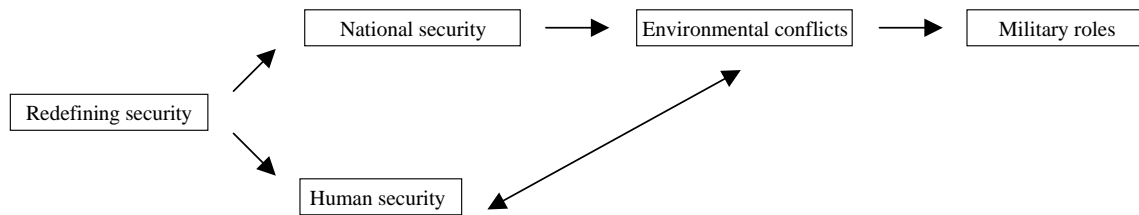*E-mail address:* jbarn@unimelb.edu.au (J. Barnett).

Fig. 1. A guide to environment-security linkages.

carrying mosquitoes as a function of changed temperature and rainfall regimes.

So, climate change is a security issue for certain communities and countries. Following on from this, in so far as its failure to reduce emissions may spell the end of the functionality of atoll-countries, the displacement of peoples from their homelands, and increased disease and mortality, then the UNFCCC is a critically important security treaty.

Advancing this argument that climate change is a security issue, this paper aims to explore in greater detail the connections between climate change and security. It does this by following an heuristic guide to the broader environment and security literature to assess the array of linkages between the particular problem of climate change and security (Fig. 1). It discusses in turn the origins of the idea that climate change is a security issue, its national security dimensions, the widely held assumption that climate change may trigger violent conflict, its implications for the military, the risks it presents to human security, and the utility of understanding climate change as a security issue in these ways.

2. Redefining security and climate change

Security is a multifaceted concept. The national referent dominates discussions of security, large scale violent conflict is the concern that receives the most attention from policymakers, and developing military capability to respond to possible violent conflicts consumes large amounts of public resources: an average of 2.9% of every nation's Gross Domestic Product was spent on defence expenditure in 1996 (UNDP, 1998). However alternative risks to security and alternative referent objects (such as humans) are increasingly being considered. One of these risks is environmental change. Climate change, however, has received little attention in this process (but see van Ireland et al., 1996; Rahman, 1999).

The beginnings of a climate change—security discourse can be traced *This Endangered Planet* (Falk, 1971). Falk outlined what he called 'the first law of ecological politics' which is strikingly relevant for the issue of climate change adaptation, namely: "there exists an inverse relationship between the interval of time available for adaptive change and the likelihood and intensity of violent conflict, trauma, and coercion accompanying the process of adaptation" (p. 353). This is a truism of contemporary climate change research: the faster the rate of change, the less time to adapt and the more 'dangerous' climate impacts are likely to be.

Lester Brown's *Redefining National Security* (Brown, 1977) was very influential in forging the links between climate change and security. Its discussion particularly focused on food security, a subject which has subsequently received considerable attention from climate impacts researchers (Murdiyarso, 2000; Parry et al., 1999; Sanchez, 2000; Wilkie et al., 1999). Brown argued that armed forces are incapable of meeting the challenges posed by climate change, suggesting that disarmament and budgetary reallocations were important policy responses. Six years later Wilson similarly argued that military responses and nation-centred *Realpolitik* would not deliver solutions to climate change. An American, Wilson's argument that "sustainable security for this country rests crucially on an active and creative participation in the politics of the world predicament [of environmental change]" seems, in retrospect, extremely prescient.

The publication of *Our Common Future* in 1987 marked the beginning of the official use of the term 'environmental security'. By 1989 the argument that environmental change was a security issue for nations and people was increasingly made in both environmental and security journals. The thawing of relations between NATO and the former USSR, and the sudden fall of the Berlin Wall explains this expansion in the environmental security literature: conventional understandings of security were becoming less relevant, and environmental concerns were increasingly in the forefront of public concerns (Dalby, 1992). According to Smil, environmental security has now replaced the threat of global nuclear warfare as it shares two characteristics: both are global in reach and the effects of both could be highly devastating (Smil, 1997). Indeed, the landmark international Toronto Conference in 1988—the first international meeting of scientists and national policymakers to highlight the dangers of climate change—was called *The Changing Atmosphere:*

Implications for Global Security. Perhaps overly dramatic, the conference concluded that: "humanity is conducting an unintended, uncontrolled, globally pervasive experiment whose ultimate consequences could be second only to a global nuclear war". Subsequent papers which have considered climate change as a security issue include: Brown (1989), Brown and Kane (1994), Edwards (1996, 1999), Ehrlich and Ehrlich (1991), Gleick (1992), Homer-Dixon (1991), Lipschutz and Holdren (1990), Mathews (1989), Myers (1994), Page (2000), Rowlands (1991) and Westing (1989).

3. National security and climate change

The potential impacts of climate change on nations has been considered as a national security issue. Climate change figures in the United States' National Security Strategy (NSS), although in at times incoherent ways as in the 1996 NSS which countenanced the possibility that there might be armed competition between nations for "dwindling reserves of uncontaminated air" (Clinton, 1996, p. 26).

Because sovereignty over delineated territory is the material substrata of national security, then physical processes such as sea-level rise pose substantial security risks: for example a 45 cm rise in sea-level will potentially result in a loss of 10.9% of Bangladesh's territory, forcing some 5.5 million people to relocate (IPCC, 2001). Equally severe are the risks to small islands as a result of as rising seas and increasing climate variability. However, long before evacuation the socioeconomic impacts of global warming on islands may be "so profound that they dwarf any strategic issue currently confronting a major peacetime economy" (Hoegh-Guldberg et al., 2000, p. 4).

National security also has an internal dimension in that it is partly a function of state legitimacy. Governments in states where the material well-being of people is highly variable to external forces such as changing terms of trade, or where material well being is in decline, tend to be relatively more unstable, and the country relatively more prone to internal violent conflict (Rapkin and Avery, 1986). There is some analysis that suggests that this may be the case for exogenous environmental shocks as well, although it should be noted that most of the time most states manage environmental disasters without political repercussions (Hauge and Ellingsen, 2001). Climate change may have many other indirect negative effects that can undermine the legitimacy of governments, it may: undermine individual and collective economic livelihood; affect human health through reduced availability of freshwater and food, and by exposing people to new disease vectors; undermine state wealth and military capability; and exacerbate inequalities between people.

The impacts of climate change will have financial costs, and in some cases these are sufficiently large to justify understanding climate change as a security issue. Consider, for example, Hoegh-Guldberg et al.'s (2000) estimate that coral bleaching will reduce future GDP by some 40–50% by 2020 in smaller Pacific islands, remembering that these losses are those expected to occur only as a result of coral bleaching and its knock-on effects. Further, the World Bank estimates the losses due to climate change in Kiribati to be in the order of 17–34% of current GDP by 2050 (an absolute loss rather than a reduction in GDP growth) (World Bank, 2000a, p. 7).

Measures implemented to reduce greenhouse emissions will also impose costs to national economies. It is US President George Bush's assumptions about the cost of reducing emissions and about lost competitive advantage that apparently underlie US reticence on the Kyoto Protocol. Similarly, the Australian Government argued that the Kyoto Protocol would particularly adversely affect Australia's economy and so that country's final Kyoto target was a 108% change above 1990 levels of emissions. But it is the oil exporting countries who have arguably the greatest to fear from the Kyoto Protocol. Most models suggest that policies to implement the Kyoto Protocol (using a carbon tax as a proxy for response measures) will increase oil prices and reduce demand in developed countries (which account for 60% of world oil consumption), thereby driving down global oil demand, prices and therefore projected revenues for oil exporters. For example, a 0.45% decline in projected GDP in OPEC countries for 2010 is forecast by Bernstein et al. (1999) (see Barnett, 2001a for a fuller discussion of this issue). However, these costs of implementing response measures, although experienced differentially among states, are nevertheless small relative to the expected costs of impacts, and so cannot be said to constitute a problem of such a magnitude to warrant considering them as a national security issue.

Finally, given the dominant focus of national security policy on violent conflict and transborder incursions, the issue of whether, and how climate change may stimulate conflicts and increase migration is important. These issues will be discussed in the following section, however suffice to say now that violent conflict is a security issue for those states who are directly involved, and may indirectly affect other states who may choose to or be obliged to intervene as negotiators or peacekeepers, and through disruptions to trade.

4. Climate change, violent conflict, and migration

It is necessary to be cautious about the links between climate change and conflict. Much of the analogous

literature on environmental conflicts is more theoretically than empirically driven, and motivated by Northern theoretical and strategic interests rather than informed by solid empirical research (Barnett, 2000; Gleditsch, 1998). This in part reflects the long-standing difficulties in finding meaningful evidence of the determinants of violent conflict and war at international and subnational levels.[1]

On the basis of existing environment-conflict research there is simply insufficient evidence and too much uncertainty to make anything other that highly speculative claims about the effect of climate change on violent conflict, a point that both policy makers and climate scientists should not lose sight of. Ultimately, as Baechler argues, there is a need for more ''elaborate case studies'' which are linked with other studies of conflict that deal with interacting ''crucial issues such as poverty, ethnicity and state'' (1999b, p. 108). Only then can assessments of utility for policy be delivered. Three criteria can be used to frame and scale such a research programme: political scale (between or below states); the nature of governance; and the nature of environmental (as opposed to resource) changes affected by climate change. These will now be discussed in turn.

4.1. Political scale

Despite the ambiguity of past environment-conflict research, there is common agreement that there are links (if vague) between environmental change and violent conflict. However, it has not been shown that environmental factors are the only, or even important factors leading conflict (Homer-Dixon and Blitt, 1998; Baechler, 1999c). Other factors such as poverty and inequities between groups, the availability of weapons, ethnic tensions, external indebtedness, institutional resilience, state legitimacy and its capacity and willingness to intervene seem to matter as much if not more than environmental change per se (see Baechler, 1999b).

Importantly, it has been comprehensively demonstrated that environmental factors do not, and nor are they likely to trigger open conflict between nation-states (Baechler, 1999a; Homer-Dixon and Percival, 1996; Wolf, 1999). So, except in the case of a low probability/high impact event such as widespread loss of land as a result of melting of the West Antarctic Ice Sheet (causing sea-level to rise by some 4–6 m), climate change impacts are unlikely to be a factor in violent conflicts between states (van Ireland et al., 1996 are in agreement). This applies equally to climate change

mitigation, where it seems extremely unlikely that violence will erupt between states over disagreements about greenhouse gas emission reductions, although changes in the political economy of energy resources may change the nature of competition between states. Conflicts in which environmental change appears to be a contributing factor tend to be within rather than between states, and it is at this sub-state level that a climate change-conflict research agenda would most profitably focus.

4.2. The nature of governance

The political and economic structure of the state is critical in preventing environmental conflicts. Industrialised economies partake of a global division of labour and resources which affects a global division of environmental degradation as environmental externalities are transferred to developing countries, so they have tended to experience less environmental damage in the past 50 years. Also, up to a certain level of mean per capita income, developed countries tend to have lower levels of pollution, although as important as increased wealth is an equitable distribution of power within states (Torras and Boyce, 1998). In addition, it can be argued that the levels of wealth in the industrialised world allows for institutions that provide stability and resilience to environmental change. Well financed government, the insurance industry, transport and communications infrastructure, a degree of democratic participation, and a base level of personal affluence all seem to help hedge against turmoil in the face of environmental stress (Barnett, 2001b). Finally, trade between similarly affluent liberal-democracies assists in the transfer of goods and services that help enhance resilience and decrease the likelihood of crises within states. So, relative to developed countries, developing countries must contend with more potentially conflict-inducing environmental changes. This is not to say, however, that severe climate impacts, particularly low-probability/high impact events such as slowing of the oceanic thermohaline circulation in the North Atlantic, could not ultimately be a source of destabilisation in the developed world in the future.

'Strong states' with a high trade/GDP ratio tend to be less prone to internal conflicts. Their capacity to foster collective action and identity mitigates against debilitating conflicts among heterogeneous groups motivated by either 'greed' or 'grievance' (Collier, 2000; de Soysa, 2001). They have effective administrative hierarchies and they control the legitimate use of force, which helps manage potential internal challengers. They also have the capacity to mediate impending conflicts before they turn violent. Both democracies and strongly authoritarian regimes appear to experience relatively less interstate conflicts (Eckstein and Gurr, 1975). Strong and

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[1] Violent conflict is defined here as crises between groups leading to deaths, a category short of war which is defined as a crises leading to more than 1,000 deaths (Wallensteen and Sollenberg, 1997). This fits with Singer's (1972) typology of conflict escalation, starting from competition, rising to contention, then rivalry, conflict, crises, and then violent conflict and ultimately war (Singer, 1972).

stable states are also more capable of managing environmental degradation and change, thus Hauge and Ellingsen (2001) find that there is a (albeit weak) positive correlation between state regime type, environmental quality, and internal conflict. It is states undergoing marked economic and political transitions that are relatively more prone to internal violent conflict and state failure (Esty et al., 1999).

There is uncertainty about the extent to which—and how—poverty and inequality are factors in violent internal conflicts (Boyce et al., 1999; Gleditsch, 2001). Most researchers agree that relative and absolute poverty are important variables, however Collier (2000) argues that this is less to do with resistances to poverty per se, and more to do with the way inequality can be discursively used to mobilise large numbers of people in support of those seeking widespread support in their quest for power. Regardless, in addition to focussing at the intra-state level, a climate change-conflict research agenda would most profitably focus on those transition economies and transition democracies where income inequalities are high.

4.3. Environmental change: scarcity or abundance?

Throughout the 1990s an argument was developed, and widely accepted, that scarcity of renewable environmental resources can contribute to violent conflicts within states (Baechler, 1999a; Homer-Dixon, 1991; Homer-Dixon, 1999; Kaplan, 1994). This argument has since been extensively and persuasively critiqued on methodological, theoretical and policy grounds to the point where it is adhered to by only an ardent few (who seem increasingly like the small but ardent climate sceptics) (Barnett, 2000; Dalby, 1996; Deudney, 1991; Collier, 2000; Gleditsch, 2001; Hartmann, 2001; Matthew et al., 2001; de Soysa, 2001; Wolf, 1999). This is an important point of departure which challenges the prevailing discourse that climate change may trigger violent conflict. The connections, if any, are more complex than a simple climate change—scarcity—conflict formulation.

It has recently been argued that it is the abundance of natural resources, rather than their scarcity, that drives conflict (Collier, 2000; de Soysa, 2000, 2001). Using statistical modelling, de Soysa and Collier both find scarcity of renewable resources is not correlated with political instability, nor is ethnic diversity. The issue is not competition over scarce resources, but rather competition to gain dominant control over substantial income generating resources, or more equitable access to the spoils of resource extraction.

A second important finding from this research confirms the findings of the State Failure Task Force (Esty et al., 1999) that openness to trade reduces the likelihood of civil conflict. De Soysa (2001) contends

that this is because openness to trade is associated with bigger and better institutions of governance which are necessary to mitigate and manage the impact on people of fluctuations in trade in ways that do not disrupt the benefits of trade. The implication of this is that structural adjustment programs which liberalise trade barriers may well promote peace, yet when 'good governance' programmes affect a contraction in the size of the state the result may be greater instability (Barnett, 2002; Chossudovsky, 1998).

If it is abundance rather than scarcity, and greed rather than grievance that are factors in violent civil conflict, then this raises substantial difficulties with the assumption that climate change may trigger violent conflicts. The impacts of climate change will for the most part make renewable resources more scarce, yet if scarcity does not play a role in violent conflict, then nether will increased scarcity in a climate changed future.

There may be other ways that climate change contributes to future violent conflicts, but these are highly uncertain and will operate through more complex environmental and social process. For example climate change may alter the supply of valuable forestry resources on a global scale so that remaining stocks in equatorial developing countries become more valuable, increasing the commercial incentive to capture and control them via the use of force. In so far as the most contested resources are metals and gems, however, climate change is unlikely to affect a shift in global supply and demand of these. It may also be possible that as climate change retards growth in climate sensitive economies this may lead to greater frustration with political systems unable to deliver jobs, and repeated failure to do so could cause political instability and possibly violent conflict. Finally, it may be that climate change stimulates more migration which can be a factor in violent conflict.

4.4. Migration, conflict and climate change

The movements of people and subsequent inter-group rivalry has been a factor in many so called 'environmental conflicts' (see Baechler, 1999a; Gizewski and Homer-Dixon, 1998; Goldstone, 2001; Howard and Homer-Dixon, 1998; Klötzli, 1994; Percival and Homer-Dixon, 2001; Swain, 1993). The point of contention in the literature is the extent to which environmental change is a factor in migration decisions. People rarely migrate for environmental reasons alone. A range of factors including economic opportunity operate in unison, and these are in flux as a consequence of the economic and cultural effects of globalisation. A sensitive understanding of the way climate change may induce more migration in any particular place requires understanding the way it will interact with other factors,

and the ways these factors may change as climate change will have uneven impacts on even proximate social and ecological systems.

To say that sometimes the influx of migrants into new areas can be a significant factor in violent conflict is relatively uncontentious. Nevertheless, by no means all, indeed very few, large scale migrations end in conflict, as Goldstone observes:

> the crucial element is not migration per se; economic migration often leads to substantial benefits for both migrants and the destination country. What appears to matter for conflict are those cases wherein migration leads to clashes of national identity (2001, p. 96).

Identity conflicts are no way natural outcomes of inter-group mixing, rather they are the product of political forces seeking to gain power or defend against perceived threats to power. Group identity is socially constructed and malleable (Walker, 1993). It is therefore less the movement of people and more the political and institutional responses to that movement that matters most in conflicts in which immigration is a factor. The receptiveness of leaders of both immigrant and host groups is very important for peaceful adaptation and settlement. Prior negotiation may well pave the way for peaceful and sustainable relocations.

So, large migrations have at times lead to conflict, and large migrations are likely as a consequence of climate change. If they are to occur at all, climate-induced conflicts are most likely as a result of migration (van Ireland et al., 1996; Rahman, 1999). In the first instance it will be climatic extremes and increasing climate variability that will enhance migration as soils are degraded, water supplies are contaminated and depleted, housing, livestock and infrastructure are destroyed, insurance costs rise and lives are lost. While communities generally adapt and are generally resilient to extreme events, climate change may stretch the limits of adaptability and resilience, making migration an attractive if not the only option to preserve livelihoods and quality of life.

Sea-level rise is very likely to induce large scale migration in the longer-term. According to Nicholls et al. (1999) by 2080 the flood risk for people living on islands will be 200 times greater than in a situation where there was no global warming, by which time up to 70% of the world's coastal wetlands could be lost. Therefore, to avoid climate-induced migration and the subsequent risk of violent conflict, slowing the rate and ultimately reducing the amount of greenhouse emissions, as well as enhancing adaptive capacity is essential.

It is likely that for those social-ecological systems that are highly sensitive to climate change existing avenues of migration will be explored first. In developing countries planning for enhanced internal migration and interna-

tional immigration is required given that they are more vulnerable to the impacts of climate change and most existing migration is within and between developing countries. Thus many of the 5.5 million people living on the Ganges Delta in Bangladesh who will be forced to relocate with a 45 cm rise in sea-level may seek to move inland within Bangladesh, but a significant number may seek to move to neighbouring India and Pakistan—and previous migration of this kind has been a factor in violence in the region (Swain, 1996). Existing patterns of 'environmental refugees' may also be indicative of the places from where climate migrants might emerge as these represent movements from areas already under environmental stress, and therefore susceptible to further stress due to climate change.[2]

For those countries already dealing with large influxes of migrants, and for those likely to receive increasing numbers of migrants as a consequence of climate change, forward looking assessments and forward planning for climate immigrants should be a policy priority. Throughout the world immigration policies require rethinking. Closing out immigrants may be of marginal effectiveness and, particularly for developed countries, morally difficult to sustain since it is their emissions that will have caused the problem. A potentially more effective and respectable policy option would be controlled acceptance and resettlement of immigrants and promotion of racial tolerance domestically. Carefully timed acceptance of immigrants from climate sensitive areas from an early stage can ease adaptation for immigrants and host communities alike.

The challenges to immigration policy are borne out in the case of the Pacific Islands. It is incumbent on Australia, New Zealand and the United States to prepare for greater numbers of Pacific Island immigrants as these countries are capable of accommodating larger numbers of people, they already have substantial populations of Pacific Islanders, and they are in no small way responsible for climate change. The Prime Minister of Tuvalu, Ionata Ionata said in February 2000 that "Tuvaluans are seeking a place they can permanently migrate to should the high tides eventually make our homes uninhabitable" (Fiji Times February 23). In June 2000, New Zealand said it would accommodate Tuvalu citizens should they be required to leave their homelands due to climate change. However, not all Pacific Island countries are talking about refuge, the Marshall Islands publicly rejected the topic during interviews at the sixth Conference of Parties in 2000 (Fraser, 2000), and Kiribati has consistently refused to consider it, with climate change officer Nakibae Teuatabo saying: "I think of emigration as being the stage where you know

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[2] Environmental refugees is a contentious term, see MacKellar et al., 1998, and Lonergan and Swain, 1999. For this reason this discussion avoids the term 'refugee' as much as possible.

you're losing the battle. We're nowhere near that" (in Pearce, 2000, p. 47).

To conclude, further research is required before confident predictions that climate change will induce violence can be made. A research programme looking to empirically investigate climate-conflict linkages in greater detail would be most effectively targeted at the sub-state level in countries where governance systems are in transition, levels of inequality are high, social-ecological systems are highly sensitive to climate change, and which have a history of large scale migration.

5. The military and climate change

As the organisations principally responsible for national security, and commanding a large share of public resources for that purpose, the world's militaries will increasingly have to manage the challenges of climate change. Militaries are major emitters of greenhouse gases. A crude indicator of the scale of this can be gained from taking the share of a country's GNP spent on its military as representative of the military's share of that country's overall greenhouse gas emissions (assuming military emissions per unit of GNP are the same as the national mean of emissions per unit of GNP). Following this procedure: military expenditure was 11.7% of 1995 GNP in the Russian Federation, so the Russian armed forces emits roughly 185 million metric tons of CO_2; military expenditure was 3% of 1995 GNP in the United Kingdom, so the UK armed forces emit some 17 million metric tons of CO_2; and military expenditure was 3.8% of 1995 GNP in the United States, so by this reckoning, the US armed forces emit some 210 million metric tons of CO_2 (data from World Bank, 2000b). Indeed, worldwide military activity may be responsible for more greenhouse gas emissions than all of the United Kingdom. In this respect, militaries are a problem rather than a solution to environmental insecurity.

Recognising the growing need for national governments to reduce greenhouse emissions, a number of armed forces are voluntarily becoming involved in greenhouse gas reduction programmes. The Australian Department of Defence has joined the Australian Greenhouse Challenge and is seeking to cut its greenhouse gas emissions by 13% by 2004. In February 2001, the United Nations Environment Programme, The US Environmental Protection Authority and the US Department of Defence hosted a conference on 'The Importance of Military Organisations in Stratospheric Ozone Protection and Climate Protection' which was attended by representatives from more than 35 countries and sought to share experiences of greenhouse gas reduction within the armed forces. The US Department of Defence claims to have reduced its greenhouse gas emissions by 20% between 1990 and 1996 (and so could well give lessons to other Government agencies) (DOD, 2000). Nevertheless, with more than 250,000 trucks, 22,000 aircraft and hundreds of ships, a smaller US military would yield far greater reductions in greenhouse emissions than its ecological modernisation (DOD, 2000).

Apart from the emissions arising from military activity, military expenditure displaces spending on environmental and social goals. For example, an April 1997 press release from the Australian Ministry for Defence gave the following annual fuel costs for Australia's various weapons platforms: F-111 aircraft—A\$8 million; F/A-18 aircraft—A\$19 million; DDG destroyers—A\$19 million; and FFG frigates—A\$15 million. The total annual fuel bill for operating Australia's eight major weapons platforms in 1997 was A\$48.6 million; to compare, Federal funding for renewable energy research and development in 1998 was A\$16 million (Parer, 1998).

Should climate change have drastic impacts militaries may become involved in conflicts and peacekeeping. Indeed, this central to the United State Department of Defense's environmental security policy:

> DOD's view of 'environmental security' [also comprises] … understanding where environmental conditions contribute to instability and where the environment fits into the war and peace equation; bringing defense-related concerns to the development of national security; [and] studying how defense components can be used as instruments of US global environmental policy (p. 133 of the 1996 *Environmental Change and Security Project Report*).

However, such a reactive position, and the subsequent resources consumed in that quest are unlikely to provide environmental security.

6. Human security

That climate change poses risks to human welfare is relatively uncontentious in both climate science and climate policy circles. People living on atolls, on coasts, in areas affected by El Nino, in drought-prone areas and arctic regions are all likely to experience negative impacts from climate change. It is not only the long-term change in mean conditions that is the problem, but also the possibility of increasingly variable (less predictable) climate, increasingly severe and frequent extreme events, increasing adjustments in institutions, and the possibility of violent conflicts which may render welfare and livelihoods less secure. Security in this sense is human security.

The United Nations Development Program (UNDP) propose the concept of human security to assist in the

framing of development and justice issues, seeing it as being:

> concerned with how people live and breathe in a society, how freely they exercise their many choices, how much access they have to market and social opportunities—and whether they live in conflict or peace.

Human security is not a concern with weapons—it is a concern with human life and dignity (UNDP, 1994, pp. 22–23).

This is clearly germane to the impacts of climate change on individual and community welfare and livelihoods.

Environmental insecurity in this context is the double vulnerability of people that arises when underdevelopment and poverty are compounded by environmental change (Barnett, 2001b). For example, an 'average' woman from the Marshall Islands has a life expectancy fourteen years less than an Australian woman, her child is thirteen times more likely to die as an infant compared to an Australian child, and she earns only 8% of her Australian counterpart (UNDP, 1998, 1999). There are therefore clear inequities and injustices between these two countries regardless of climate impacts. However, Australians produces fifty times more greenhouse gases than Marshall Islanders, yet a meter rise in sea-level would subsume 80% of the Marshall Islands, whereas a much smaller amount of Australia's surface is likely to be flooded (Commonwealth of Australia, 1997; Holthus et al., 1992; Republic of the Marshall Islands, 2000).[3] Australia has much greater wealth as a nation, as do its people, giving them the resources to adapt at some economic but little other social cost. The difference is that for an Australian, climate change is a problem of adaptation, for a Marshall Islander the problem is a matter of survival: they are insecure. The are therefore discrepancies in responsibility for and vulnerability to climate change, and this underlies the dialectical nature of human security.

7. Conclusions: problems and possibilities for a climate–security discourse

It is clear that climate change is a security problem for some states and people. But, what does it serve us to speak of climate change in these terms and what are the implications of doing so? This is an important question that has been repeatedly taken up in the broader environmental security literature, although with little specific reference to the problem of climate change. The crux of the problem is that national security discourse and practice tends to appropriate all alternative security

discourses no matter how antithetical. It absorbs and then militarises and nationalises other security problems and referents in ways that neutralise their efficacy whilst maintaining the power of the security establishment (Brock, 1997; Dalby, 1994; Deudney, 1991). This has been the experience of environmental security.

Environmental security was originally written with the intention of exposing the inadequacy of militarised practices of security, the porous nature of sovereignty in the face of environmental change, and to elevate environmental problems from the level of 'low politics' to 'high politics' so that states would commit as much energy and resources to address environmental problems as they do to other security problems. However, the result has not been the trading off of military security for environmental security, or increased resources and energy to environmental security. Instead, environmental change problems have been militarised; the emphasis has been placed on environmental change as cause of violent conflict rather than human insecurity; and on exogenous environmental threats to the state for which unspecified Others were seen to be responsible, as opposed to attending to domestic causes of environmental change (Barnett, 2001b).

So, understanding climate change as a security issue risks making it a military rather than a foreign policy problem and a sovereignty rather than global commons problem. This may help justify further securing of the unsustainable livelihoods of the North in the way of George Bush Snr at the United Nations Conference on Development in 1992, and George W Bush over the Kyoto Protocol. It may also lead to increased attention on securing territory against undesirable knock-on effects of climate impacts such as environmental refugees, and on preparing for conflicts in important trading areas in the way of the formation of the US rapid Deployment Force after the OPEC oil crises of the mid-1970s.

Despite these problems with any potential climate-change security discourse, it may nevertheless have some utility. Security communicates a certain *gravitas* that is arguably necessary in climate change policy. In that climate change is a security problem for certain groups, identifying it as such suggests that it is an issue that warrants a policy response commensurate in effort if not in kind with war. A critical and ambiguous concept in the UNFCCC is its reference to 'dangerous' levels of climate change. Security encapsulates danger much better than concepts like sustainability, vulnerability or adaptation, and it offers a framework in which danger can be recast as widespread risks to welfare and (in the case of small island states) sovereignty. Security can also serve as an integrative concept which links local (human security), national (national security) and global (international security) levels of environmental change and response. It also integrates mitigation and adaptation as

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[3] This figure for Australia includes emissions from land clearing.

both are essential to security from climate risks. Finally, understanding processes that render insecurity, of which climate change is an important but not isolated factor, brings to the fore issues of justice and the global political-economy. Although it should not be over-stated, security addresses the possibility of violent social upheaval, and it brings military expenditure and its environmental impacts into the decision making frame-work.

The ability of conventional national security discourse and policy to appropriate climate change is a matter of how climate security risks are understood, and who talks about them. Through a grounding in the findings of the Intergovernmental Panel on Climate Change, a climate-change-security discourse could better resist appropriation from conventional national security as its key concerns will be rooted in respectable science rather than conjecture. If used by IPCC scientists a change-security discourse will have a legitimacy that renders it less amenable to appropriation and rewriting by conventional national security institutions. If such a discourse downplayed and was cautious on the issue of violent conflict and refugees, and if it pointed to the justice issues that attend climate change insecurities, then it might helpfully integrate science and policy and usefully elucidate the nature of the 'danger' that the UNFCCC ultimately seeks to avoid.

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