



I-C. Introduction to the Concepts of Environmental Security and Environmental Conflict

Michael Renner¹

1. Introduction

Since the late 1970s and 1980s, there has been an ongoing discourse with regard to the connections between environment, resources, security, conflict, and peacemaking. These connections gradually became more accepted among academics and NGOs, but were met with greater reservation by policymakers. By the mid-1990s, Robert Kaplan still felt compelled to lament: "Mention 'the environment' or 'diminishing natural resources' in foreign-policy circles and you meet a brick wall of scepticism or boredom."²

During the latter years of the 1990s, environmental issues did begin to find a place in the arena of practical foreign and security policy-making. Then, new difficulties arose in the wake of the attacks of 11 September 2001. In the United States, where policy-makers had begun to embrace notions of environmental security in the 1990s, the "war on terror" has taken centre stage, and largely brought these early efforts to a halt.

The study of how environmental issues and peace and security concerns interact is far from a monolithic undertaking. Different writers have focused on different aspects within the spectrum of connections. Some have focused fairly narrowly (i.e., limiting their inquiry to the connections between environment and the incidence of violent conflict); others have drawn far broader boundaries (i.e., adopting a broader environment and security approach). Some of the writing has focused on the impact of environmental change on the **national** security of a particular state, whereas other efforts have been primarily concerned with the consequences for **global** security.

Different schools of thought exist side by side, and the disagreements among proponents of different views and interpretations have at times been very pronounced and in a few cases even quite vehement.³ And at least some analysts question the conceptual merits of notions like "environmental security" and "environmental conflict."⁴

This introduction is not intended to engage the different schools of thought. Rather, its purpose is to provide a brief overview of the various dimensions in which environment intersects with conflict and security. In broad terms, these connections can be grouped in four categories:

1. The impact of environmental change on conflict formation. Conflicts may emerge from situations of resource and environmental **scarcity** (overuse and depletion of resources),

¹ **Michael Renner** is Senior Researcher and Director of the Global Security Project at the Worldwatch Institute in Washington, DC. Worldwatch is a private research and public policy organization focusing on global issues relating to environment and sustainability.

² Robert D. Kaplan, "The Coming Anarchy," *Atlantic Monthly*, February 1994.

³ As was the case in the exchange between Thomas Homer-Dixon on one hand and Nancy Peluso and Michael Watts on the other. See their exchange in Woodrow Wilson International Center for Scholars, *Environmental Change and Security Project*, Issue 9 (Washington, DC: 2003), pp. 89-96.

⁴ See, for instance, Daniel Deudney, "The Case Against Linking Environmental Degradation and National Security," *Millennium: Journal of International Studies*, Vol. 19, No. 3 (1990), pp. 461-76, and Daniel Deudney, "Environment and Security: Muddled Thinking," *Bulletin of the Atomic Scientists*, April 1991, pp. 22-28.

mediated and sometimes exacerbated by the social and economic repercussions of environmental degradation.

2. On the other hand, tensions and violence can also arise out of a context of contested resource **wealth**. This is only partially about access to and control over lucrative resources. Resource extraction often leads to severe environmental and other impacts on local communities. If the benefits and burdens of extractive projects such as oil production, mining, logging, and large-scale dam construction are distributed unequally, the result may be protracted conflict.

3. The environmental impact of armed conflicts, arms production, maintaining military forces, and preparations for warfare. Closely related are environmental considerations in the cleanup of military bases and in the dismantlement of obsolete or surplus weapons.

4. Opportunities for “environmental peacemaking” that may arise out of common interests among different countries or communities in safeguarding resources and ecosystems, as well as shared vulnerabilities where ecosystems are heavily degraded.

2. Defining Conflict, Redefining Security

Before discussing these connections in some detail, it is useful to consider the broader context—the effort to broaden and redefine the definition of security. The terms “conflict” and “security” are often used in very different ways by different analysts.

a. Conflict

Conflict is the more easily defined of the two terms, though not without its own set of challenges. A basic distinction needs to be made between armed conflict and disputes that are largely carried out by non-violent means. This is not an absolute distinction: non-violent struggles may at some point turn violent, and vice versa. And conflicts often do not have a well-defined start and end point, as formal declarations of war and even formal peace agreements are becoming rare. The Heidelberg Institute for International Conflict Research in Germany has identified 249 political conflicts around the world that were active in 2005. Of these, 24 involved a high level of armed violence and 74 some occasional violence. The remainder—86 “manifest conflicts” and 65 “latent conflicts”—were carried out without resort to weapons.⁵

Within the narrower category of armed conflict, peace researchers have developed a range of definitions and methodologies.⁶ Put in simple terms, war and armed conflict require the following elements: there has to be use of armed force (and there has to be some continuity of violence rather than sporadic fighting); the fighting has to be between organized groups and at least one of the conflict parties has to be a government; and there have to be battle deaths (with different thresholds established for minor, intermediate, and major conflicts (or equivalent terminologies) in terms of deaths per year or for the duration of the conflict).

While such criteria are necessary for a systematic, scientific assessment of conflict trends and developments, they are increasingly in danger of being too narrowly drawn, with the

⁵ Heidelberg Institute for International Conflict Research, *Conflict Barometer 2005* (University of Heidelberg, Germany: December 2005), p. 3.

⁶ For an overview of different conflict data collection efforts, see Taylor B. Seybolt, “Measuring Violence: An Introduction to Conflict Data Sets,” in Stockholm International Peace Research Institute (SIPRI), *SIPRI Yearbook 2002: Armaments, Disarmament and International Security* (New York: Oxford University Press, 2002), pp. 81-96.

consequence that certain types of armed violence fail to be captured in data sets.⁷ The methodological focus on battlefield deaths,⁸ for instance, means that some conflicts are recorded at a lower level of intensity than appears warranted.⁹

In most contemporary armed conflicts, the number of people killed on the battlefield is usually quite small compared with those who perish because fighting and looting shred public infrastructures, displace civilians, disrupt harvests and halt other economic activity, and prevent delivery of vital health and other services. In many cases, there is a severe lack of reliable data. But a recent study found that for every battle-related death in the Democratic Republic of the Congo, there are 62 non-violent deaths related to the conflict in the country, with malnutrition and a variety of diseases the leading causes. An estimated 3.9 million people have died there since 1998, and about 38,000 civilians continue to die every month.¹⁰

b. Security

Security is a rather vague term without a generally-agreed definition. Traditionally, it is seen as closely related to the threat or use of violence, and military means are regarded as central to the provision of security. This may once have made sense, when conflicts took place predominantly between different countries, when territorial control was a key objective, and when uniformed soldiers were the combatants. But over the last several decades, this type of conflict has become more the exception than the norm.

A number of efforts were launched to challenge this narrow approach in the 1970s and 1980s, but gained momentum after the end of the cold war. Several high-profile international commissions, NGOs, and academics developed a range of innovative concepts refining and redefining security—by including social, economic, and environmental dimensions. These became known under headings such as *common security*, *comprehensive security*, and *environmental security*.¹¹ *Human security*, the most encompassing of these concepts, was first spelled out in detail in the 1994 edition of the *Human Development Report*.¹² The gathering discourse raised a number of critical questions:

⁷ This leads to the question, as addressed by Michael Brzoska, “Is There a Necessity for New Definitions of War?” *BICC Bulletin*, (Bonn International Center for Conversion), January/February 2006, pp. 1-2.

⁸ Bethany Lacina and Nils Petter Gleditsch, *Monitoring Trends in Global Combat: A New Dataset of Battle Deaths* (Oslo: Centre for the Study of Civil War, International Peace Research Institute Oslo, 2004).

⁹ The Uppsala/PRIO Armed Conflict Dataset is one of the most respected sources of information. Yet it fails to capture certain conflicts (such as the increasing fighting in Nigeria’s Niger Delta), and it records some—such as the Rwandan genocide of 1994 or mass violence in the DR Congo after 2001—at much lower levels of intensity than appears warranted. Nils Petter Gleditsch et al., “Armed Conflict: 1946–2001: A New Dataset,” *Journal of Peace Research*, Vol. 39, No. 5 (2002), pp. 615–37; updated information in “The PRIO/Uppsala Armed Conflict Dataset. Armed Conflict, Version 3-2005b,” released 6 September 2005, at www.prio.no/cwp/armedconflict.

¹⁰ B. Coghlan et al., “Mortality in the Democratic Republic of Congo: A Nationwide Survey,” *The Lancet*, 7 January 2006, pp. 44–51; International Rescue Committee and Burnet Institute, *Mortality in the Democratic Republic of Congo: Results from a Nationwide Survey* (New York and Melbourne: December 2004).

¹¹ These included the Brandt Commission on North-South issues (1980), the Palme Commission on disarmament and security (1982), the Brundtland Commission on environment and development (1987), and the Commission on Global Governance (1995).

¹² The 1994 *Human Development Report* defined human security as entailing seven distinct categories: 1) economic security (assured and adequate basic incomes); 2) food security (physical and affordable access to food); 3) health security; 4) environmental security (access to safe water, clean air and non-degraded land); 5) personal security (physical violence); 6) community security (ethnic violence); and 7) political security (basic human rights and

- What is the object of security?
- Who is to be protected?
- What are the “threats”?
- Who is to provide security?
- And by what means?

The unfolding discourse challenged orthodox assumptions about national security, deepening it “upwards” (from national to global security) and “downwards” (from territorial security focused on states and governments to people security—individuals and communities), and widening it by arguing that non-military dimensions, such as social wellbeing and environmental integrity, are important prerequisites for ensuring security. There is now growing recognition of the important inter-connections between environment, development, and security.¹³

The core insights emerging from this discussion can be summarized as follows:¹⁴

- Weapons do not necessarily provide security—and may even heighten insecurity. This is true for adversarial states armed with weapons of such destructive power that no defense is possible. It is true in civil wars, where the easy availability of weapons empowers the ruthless but offers little defence for civilians.
- Real security in a globalizing world cannot be provided on a purely national basis, or even on basis of limited alliances. A multilateral and even global approach is needed to deal effectively with a multitude of transboundary challenges.
- The traditional focus on state (or regime) security is inadequate and needs to encompass safety and well-being for the state's population. If individuals and communities are insecure, state security itself can be extremely fragile. Democratic governance and a vibrant civil society may ultimately be more imperative for security than an army.
- Non-military dimensions have an important influence on security and stability. Nations around the world, but particularly the weakest ones, confront a multitude of pressures. They face a debilitating combination of rising competition for resources, severe environmental breakdown, the resurgence of infectious diseases, poverty and growing wealth disparities, demographic pressures, and joblessness and livelihood insecurity.

The human security concept has been criticized by a number of analysts as being too sweeping and analytically unfocused. Critics have charged that the inclusion of a wide array of social, economic, and environmental ailments makes it difficult to set priorities and translate the concept into specific policies.¹⁵

freedoms). United Nations Development Programme, *Human Development Report 1994* (New York: Oxford University Press, 1994), p. 24.

¹³ See the contributions to Robert Picciotto and Rachel Weaving, eds., *Security and Development. Investing in Peace and Prosperity* (New York and Milton Park, UK: Routledge, 2006). The book is based on deliberations of a workshop held under the aegis of the Global Development Network in New Delhi, 25-26 January 2004.

¹⁴ See Michael Renner, “Security Redefined,” in Worldwatch Institute, *State of the World 2005* (New York: W.W. Norton & Co., 2005), p. 5.

¹⁵ See, for example, Roland Paris, “Human Security: Paradigm Shift or Hot Air?,” *International Security*, Vol. 26, No. 2 (Fall 2001), pp. 87-102; Keith Krause, “Is Human Security ‘More than Just a Good Idea’?,” paper prepared for BICC 10-Year Anniversary Conference, “Promoting Security: But How and For Whom?,” Bonn International Center for Conversion, Bonn, Germany, 1-2 April 2004.

The point, however, is not to draw up a lengthy list of potential security concerns—doing so may simply run the risk of endless debates about the relative merit and importance of multiple factors. Issues such as infectious disease, water scarcity, or climate change may, at first glance, not necessarily constitute security challenges. But beyond certain thresholds of magnitude, and particularly in combination, they may well create conditions that call into question the basic fabric of communities and nations, and hence their security in a very tangible way.

Today, there are essentially two major conceptions of human security. The first approach focuses primarily on protecting people from acts of violence and violent threats to their rights, safety, or lives—“freedom from fear.” Emerging from this approach, the Human Security Centre at the University of British Columbia, Canada, launched a new annual Human Security Report in 2005.¹⁶ The second approach stresses far broader issues of human wellbeing and dignity and might be characterized as “freedom from want.” It focuses on protecting people not only from violence but also from a far more expansive array of social, economic, and environmental challenges. This approach is spelled out in detail in a 2003 report by the independent Commission on Human Security.¹⁷ (Oddly, however, this particular report failed to expressly discuss environmental dimensions of human security.)

Sometimes the connections between environment and security lead to violence. But a number of analysts have warned against overdrawn predictions of widespread or massive “environmental wars.”¹⁸ In assessing the connections between environment and conflict, it is important to understand that most conflicts in this category are likely to be sporadic, localized, and limited in terms of numbers of people killed or harmed.

It is equally important to stress that insecurity also manifests itself in ways other than violent conflict, and that such non-violent outcomes are nevertheless reason for concern. The livelihood, wellbeing, and integrity of communities (or entire societies) may be compromised in fundamental ways. The result could be prolonged periods of instability and mass suffering even short of armed violence. The task, then, is to enhance the understanding of the interactions and dynamics among different factors and the combinations that are likely to bring about destabilizing results.

3. Environmental Change and Conflict¹⁹

¹⁶ Human Security Centre, *Human Security Report 2005* (New York: Oxford University Press, January 2006). Information and downloads at: <http://www.humansecurityreport.info/>.

¹⁷ Commission on Human Security, *Human Security Now* (New York: 2003).

¹⁸ Nils Petter Gleditsch and Henrik Urdal, “Don’t Blame Environmental Decay for the Next War,” op-ed, *International Herald Tribune*, 22 November 2004. For a cautionary analysis regarding frequent predictions of future interstate water wars, see Aaron T. Wolf, Annika Kramer, Alexander Carius, and Geoffrey D. Dabelko, “Managing Water Conflict and Cooperation,” in *State of the World 2005*, op. cit. note 14, pp. 83-87.

¹⁹ Reports written by Thomas Homer-Dixon and his colleagues at the University of Toronto gave major impetus to this field of inquiry. A summary of key findings is presented in Thomas Homer-Dixon and Valerie Percival, *Environmental Scarcity and Violent Conflict: Briefing Book*, American Association for the Advancement of Science and University College, University of Toronto, 1996. Further, see Thomas Homer-Dixon and Jessica Blitt, eds., *Ecoviolence: Links Among Environment, Population, and Security* (Lanham, MD: Rowman & Littlefield Publishers, 1998). Similarly, the Environment and Conflicts Project (ENCOP) of the Swiss Peace Foundation and the Center for Security Studies and Conflict Research in Zürich, Switzerland, produced a range of incisive case studies in the early to mid-1990s. Since 1994, the Environmental Change and Security Project at the Woodrow Wilson International Center for Scholars in the United States has explored the relationships among environment, population, disease, development, migration, political stability, and violent conflict; ECSP publishes the annual *Environmental Change and Security Project Report*. For a late 1990s

Resource scarcity and environmental degradation are increasingly understood to play an important role in generating or exacerbating conflicts. The depletion of water resources, overexploitation of fisheries, degradation of arable land, decimation of forests, and growing interference in ecosystems from forests to wetlands to coral reefs are among the principal processes of human-induced environmental change. Climate change further augments already-observable challenges, by raising sea levels, shifting vegetation zones, dwindling natural habitats, changing precipitation patterns, and generating more frequent and more intense storms, floods, and droughts.

Conflict may arise over access to renewable natural resources such as water, arable land, forests, and fisheries. This may be the result of a tightening of supplies (depletion or degradation of natural resources), an unsustainable increase in demand (due to population pressures or increased per capita consumption, often related to export-led economic models), distributive inequities, or a combination of these factors. Developing countries, particularly those whose economies are heavily geared toward agriculture and other sectors that directly depend on the health of the natural resource base, are most immediately affected by environmental problems. There, the needs and interests of contending groups tied closely to the land—farmers, nomadic pastoralists, ranchers, and resources extractors—are often incompatible.²⁰

A range of case studies—both between different countries and within countries—has been generated over the years, including examples of violent and non-violent disputes relating to water diversion (such as India-Bangladesh), dam construction and irrigation (China's Three Gorges project, India's Sardar-Sarovar, and a dam along the Senegal River involving Senegal-Mauritania), land degradation and desertification (Somalia-Ethiopia, Sudan, El Salvador-Honduras), over fishing (Canada-Spain, and others).

The concept of environmental security should not be equated with an argument that environmental change is the sole causative factor in triggering conflicts or other security concerns—nor even that environmental change is necessarily a direct trigger of conflict. There is probably not a single conflict in the world that can properly be understood as mono-causal. Rather, environmental issues are tied up with other factors. Environmental degradation may be mediated and sometimes augmented by social disparities, ethnic and community rivalries, and political dynamics. A multitude of pressures (whose particular makeup varies from case to case) including persistent poverty, wealth disparities, unequal land distribution, unemployment and job insecurity, population growth, health epidemics, and environmental degradation is provoking social stress, discontent and polarization, leading to political strife in many countries and to devastating violence in some.²¹

Cases such as Rwanda and Chiapas underline this complexity. In Rwanda, mass violence in the mid-1990s grew out of a set of circumstances that included explosive population growth, severe land shortages and inequality, land degradation, lack of non-agricultural employment, a crisis in the country's coffee and tea export sector, and pain inflicted by

literature review, see Geoffrey D. Dabelko, Steve Lonergan, and Richard Matthew, *State of the Art Review on Environment, Security and Development Co-operation*, prepared for the Working Party on Development Co-operation and Environment, OECD Development Assistance Committee (Geneva: IUCN, 1998).

²⁰ See, for instance, Leif Ohlsson, *Livelihood Conflicts: Linking Poverty and Environment as Causes of Conflict* (Stockholm: Swedish International Development Agency, 2000).

²¹ For instance, a report by Population Action International assesses the interplay among demographic dynamics (in particular high proportions of young people and rapid urban population growth), land and water scarcities, and HIV/AIDS. See Richard P. Cincotta, Robert Engelman, and Daniele Anastasion, *The Security Demographic. Population and Civil Conflict after the Cold War* (Washington, DC: Population Action International, December 2003).

structural adjustment programs. Against this backdrop, opposing elites engaged in savage competition and extremist politics that led to civil war and genocide.²²

In Chiapas, Mexico's southernmost state, marginalized peasants, predominantly drawn from Mayan indigenous communities, rose up in 1994. The conflict, which took more political than violent forms, was driven by rampant inequality (widespread poverty in the face of natural wealth), demands for land reform, population pressures, inappropriate farming and ranching methods, rapid deforestation, austerity and lack of rural credit, and the domination of the political system by narrowly-based elites.²³

Energy, water availability, food security, and infectious disease are among the major concerns in the environment-security-conflict nexus. Below is a brief discussion of these factors, along with considerations of livelihood and habitability issues and the impact of disasters increasingly driven or worsened by environmental degradation.

a. Energy²⁴

Energy issues manifest themselves in a number of ways, and are strongly focused on the dominant and most sought-after commercial source, petroleum.

Especially in the mainstream discussion, the connection between energy and security is being discussed as a challenge of supply security. The current discussion is shaped in particular by the rising demand in fast-developing countries such as China and India, which join the United States, Europe, and Japan as voracious consumers and heavily import-dependent nations. Supply security is both a concern about physical supplies (with the rate of new oil discoveries falling since the 1960s) and political developments in oil-rich nations. The economic security of both supplier and buyer nations is potentially compromised by severe price swings.

Major powers have repeatedly intervened in resource-rich countries, militarily and by other means, in order to directly control, or more broadly secure access to, lucrative resources. The result has often been enduring political instability. Against the backdrop of surging demand for oil, geopolitical rivalries for preferential access are today again intensifying among major importers.

Oil income has led to a massive militarization in some regions (particularly the Middle East). Governments of oil-rich nations have tended to over invest in weapons and armies, and underinvest in human needs. And in a number of oil producing countries (such as Angola, Nigeria, Sudan, Iraq, and Colombia), oil resources have either driven internal conflicts or helped finance such struggles, leading to massive human rights violations and an erosion of human security.

Finally, oil (along with natural gas and coal) of course plays a central role with regard to carbon emissions and thus climate stability, an issue that poses grave threats to human safety everywhere on the planet.

²² Michael Renner, *Fighting for Survival. Environmental Decline, Social Conflict, and the New Age of Insecurity* (New York: W.W. Norton & Co., 1996), pp. 114-122.

²³ *Ibid.*, pp. 122-130.

²⁴ Thomas Prugh, Christopher Flavin and Janet L. Sawin, "Changing the Oil Economy," in *State of the World 2005*, op. cit note 14, pp. 100-119; Michael Renner, "Resource Dimensions of the Global Security Agenda," Paper presented at Conference on Rethinking Global Security: An African Perspective, Nairobi, Kenya, 23 February 2006.

b. Water²⁵

Water is the most precious resource. Both the quantity and quality are crucial for meeting fundamental human needs. Worldwide, more than 430 million people currently face water scarcity, and the numbers are set to rise sharply. Given population growth, nearly 3 billion people are expected to live in water-stressed countries by 2015.

Conflicting claims over water resources have been cited as a possible cause of violent clashes between nations that share rivers such as the Nile, Tigris and Euphrates, Ganges, and Brahmaputra. The waters of the Jordan and Litani rivers did indeed play a role in the Middle Eastern conflicts between Israel and its Arab neighbours. For a number of reasons, cooperation, rather than conflict, has so far been the norm among riparian states. One is that a militarily weak downstream country is unlikely to challenge its upstream neighbour over water allocation issues. And riparian countries often conclude that a diplomatic solution—working out an agreed plan to share available water resources—is far preferable to a violent solution. Still, this may not necessarily hold true in the future.²⁶

Meanwhile, water-related conflict is far more likely to occur within, than between, nations. China, India, Mexico, the United States, Spain, the Central Asian republics, and parts of the Middle East and Africa are among the countries and regions in which growing water scarcities have caused considerable internal disputes and, in some cases, violent confrontations.

c. Food Security²⁷

An adequate and reliable supply of food is one of the most basic determinants of how secure or insecure people are. Food security is at the intersection of water availability, poverty, land distribution, and environmental degradation. And among the major food security threats on the horizon are climate change, the loss of biodiversity, and the possible repercussions of monocultures and factory farming.

After a steady decline during the first half of the 1990s, the U.N. Food and Agriculture Organization found that hunger grew again in the latter part of the last decade. Nearly 2 billion people worldwide suffer from hunger and chronic nutrient deficiencies.

Some 1.4 billion people live precariously off marginal lands. Of these, more than 500 million people live in arid regions, more than 400 million people eke out a meager living on soils of very poor quality, some 200 million small-scale and landless farmers are compelled to cultivate steep slopes, and 130 million people live in areas cleared from rainforests and other fragile forest ecosystems. The soil productivity of slopes and formerly forest-covered lands tends to be exhausted relatively swiftly, forcing people to move on to seek opportunity elsewhere, sometimes in distant cities or in competition with other rural dwellers.

²⁵ For a recent treatment of water conflict and cooperation, see Wolf, Kramer, Carius, and Dabelko, "Managing Water Conflict and Cooperation," op. cit. note 18, pp. 80-95. Also, see Peter H. Gleick, "Water and Conflict," and Miriam R. Lowi, "West Bank Water Resources and the Resolution of Conflict in the Middle East," both in *Occasional Paper No. 1*, Project on Environmental Change and Acute Conflict, American Academy of Arts and Sciences and University of Toronto, September 1992.

²⁶ John Reid, "Water Wars: Climate Change May Spark Conflict," *Independent*, 28 February 2006.

²⁷ This discussion is based on Danielle Nierenberg and Brian Halweil, "Cultivating Food Security," in *State of the World 2005*, op. cit. note 14, pp. 62-77. Also see U.N. Food and Agriculture Organization, *The State of Food Insecurity in the World 2003* (Rome: 2003).

Depending on the circumstances, the outcome of food insecurity may in some cases be a violent one. In Africa's Sahel region, there are increasing clashes between herders and farmers competing for scarce productive land, particularly as desertification increases. Examples include conflicts in northern Nigeria, Kenya, and in Sudan's Darfur region. The clashes may be reported as ethnic and religious struggles (or even be perceived as such by the protagonists), but it is clear that resource scarcities play an important role.²⁸

d. Infectious Disease²⁹

Although the poor are most vulnerable, societies across the planet are confronting a resurgence of infectious diseases. Some 20 known diseases have re-emerged or spread geographically in recent years, and many new ones, such as SARS and avian flu, have been identified. Pathogens are crossing borders with increasing ease, facilitated by growing international travel, trade, and migration, but also riding the coattails of social upheaval inherent in war and refugee movements.

Environmental factors play an important role in human susceptibility to and transmission of diseases. Logging, road-building, dam construction, and climate change enable diseases like malaria, dengue fever, and schistosomiasis to spread to previously unaffected areas or bring people into closer proximity with new disease vectors.

Disease burdens can in some cases be sufficiently severe to undermine economies and threaten social stability. In the poorest developing countries, infectious diseases are deepening poverty and widening inequality, drastically reducing life expectancy, overwhelming fragile health systems, and severely taxing overall economic health. The HIV/AIDS epidemic in southern Africa, in conjunction with malaria, already has a devastating impact on farm production and food security because it incapacitates and kills primarily young adults during their peak productive years. (AIDS is projected to claim a fifth or more of the agricultural labour force in most southern African countries by 2020.)

Water, food, and health challenges, among others, can undermine livelihoods, overwhelm communities' ability to cope, and unravel the social fabric of fragile societies, particularly when adverse impacts make themselves felt in highly unequal ways. But they can also lead to violent conflict, setting different communities against each other in direct competition over scarce resources, as has been the case, for instance, between farmers and pastoralists in Darfur.³⁰

e. Livelihood and Habitability Challenges

Environmental degradation may in some cases be sufficiently extreme to undermine the habitability of a given area and to compel affected populations to leave in search of new homes. Growing water scarcity, soil erosion, desertification, deforestation, and other environmental calamities are now contributing to the uprooting of large numbers of people—in effect creating flows of “environmental refugees.” Although reliable (or uncontroversial) estimates do not exist, environmental refugees in all

²⁸ Ed Stoddard, “Scarce, Degraded Land Is Spark for Africa Conflict,” *Yahoo News*, 22 July 2005; Tim Large, “Interview: Advancing Deserts Fuel African Conflicts,” *Reuters AlertNet*, 23 January 2006.

²⁹ Dennis Pirages, “Containing Infectious Disease,” in *State of the World 2005*, op. cit. note 14, pp. 42-59; Jonathan Ban, *Health, Security, and U.S. Global Leadership* (Washington, DC: Chemical and Biological Arms Control Institute, 2001).

³⁰ Dan Connell, “The Politics of Slaughter in Sudan,” *Middle East Report Online*, 18 October 2004, www.merip.org/mero/mero101804.html; Peter Verney, “Darfur's Manmade Disaster,” *Middle East Report Online*, 22 July 2004, www.merip.org/mero/mero072204.html.

likelihood already number in the tens of millions worldwide.³¹ An estimated 135 million people—many in sub-Saharan Africa—are at risk of being driven from their lands because of desertification.³² And climate change may cause as many as 150 million environmental refugees by 2050, according to the Intergovernmental Panel on Climate Change.³³

Such displaced populations may find it difficult to find new livelihoods in other rural areas (or in already-crowded cities) and may even clash with unwelcoming host communities. The influx of people can impose a considerable burden on the receiving area in terms of increased competition over land, water, jobs, communal facilities, and social services. This is especially the case if the host community's economy is stagnant or in decline, if government is corrupt and indifferent to the needs of its people, or if the influx is sudden and massive. All too often, newcomers are seen as unwelcome competitors and accused of irredeemably altering the local culture and customs. And political leaders or challengers are sometimes eager to capitalize on stirring up resentments.³⁴

f. Disasters

In addition to the gradual undermining of livelihoods, environmental degradation is setting the stage for more frequent and more devastating natural disasters. And the deterioration of forest watersheds, wetlands, coral reefs, and other ecosystems also means that human communities have less protection against extreme weather events and other disasters.

The number of disasters has risen from about 750 in 1980-84 to almost 2,000 in 2000-2004. The number of people affected has risen from about 500 million to 1.4 billion during the same period of time.³⁵ And the pace is likely to accelerate in coming years as climate change translates into more intense storms, flooding, heat waves, and droughts.

Disasters often have devastating impacts on the safety and wellbeing of affected communities in terms of people killed and injured, health epidemics, dwellings destroyed, and damage to industries, fisheries, agriculture, and critical physical infrastructure. Economic and ecological marginalisation worsen the impacts on poor people and ethnic minorities.

Disasters may undermine the long-term habitability or economic viability of an affected area. But even where the effects are more temporary, disasters often exact a heavy toll in terms of indebtedness, poverty, and unemployment. Such adverse effects can easily deepen fault lines—between rich and poor, urban and rural communities, and different ethnic groups. In divided societies, conflict may arise if relief and reconstruction aid are wielded as a tool for dispensing favours to one community or group over another or for tightening the government's political control.³⁶

³¹ Rhoda Margesson, "Environmental Refugees," in *State of the World 2005*, op. cit. note 14, pp. 40-41.

³² "Creeping Desertification: The Cause and Consequence of Poverty," *Environment News Service*, 18 June 2004.

³³ Ibid.

³⁴ Renner, *Fighting for Survival*, op. cit. note 22, pp. 97-113; Hal Kane, *The Hour of Departure: Forces that Create Refugees and Migrants*, Worldwatch Paper 125 (Washington, DC: Worldwatch Institute, June 1995).

³⁵ Center for Research on the Epidemiology of Disasters (CRED), *EM-DAT: The OFDA/CRED International Disaster Database*, at www.em-dat.net; Munich Re, *Annual Review: Natural Catastrophes in 2005* (Munich: 2006).

³⁶ Michael Renner and Zoë Chafe, "Turning Disasters into Peacemaking Opportunities," in Worldwatch Institute, *State of the World 2006* (New York: W.W. Norton & Co., 2006).

It is not a given that competition over scarce resources or the repercussions of environmental degradation will lead to violent conflict. But they often do sharpen hardships and burdens, heighten the desperation of those most affected, and reinforce the perception that disputes are of a “zero-sum” nature. Different social groups and communities experience the effects of resource depletion and environmental degradation unevenly. These divergences can reinforce social and economic inequities or deepen ethnic and political contention.

Because many societies fall short on conflict prevention and mediation capacities, and political leaders (or their challengers) often find that they can gain influence or strengthen their power by fanning the passions, it is likely that environmental factors will play an increasingly important role in triggering or aggravating conflicts. Worst-case outcomes are more likely where political grievances are left to fester, where public institutions are weak or corrupt, and where weapons (particularly small arms) are easily available.

4. The Repercussions of Resource Wealth

Whereas the connection between resource scarcity and conflict is still a relatively young field of study, struggles over resource wealth are well-documented. Indeed, throughout human history, big powers have repeatedly intervened in resource-rich countries, militarily and by other means, in order to control lucrative resources. There are indications that a fresh round of jockeying among major powers (and importers) is in the offing.³⁷

During the 1990s and the first decade of the new century, resources such as oil, minerals, metals, diamonds, timber, and agricultural commodities have played an important role in a number of civil wars. The money derived from the often illicit resource exploitation in war zones has secured an ample supply of arms for various armed factions and enriched a handful of people—warlords, corrupt government officials, and unscrupulous corporate leaders. But for the vast majority of the local people, these conflicts have brought a torrent of human rights violations, humanitarian disasters, economic calamity, and environmental destruction. Some 5 million people were killed in resource-related conflicts during the 1990s, close to 6 million fled to neighboring countries, and 11–15 million people were displaced inside their own countries.³⁸

We can distinguish three different sets of circumstances:³⁹

1. In some places, including Colombia (oil and cocaine), Angola (oil and diamonds), Afghanistan (opium, lapis lazuli), and Cambodia (timber), the pillaging of resources allowed violent conflicts to continue that were initially driven by grievances, or by secessionist and ideological struggles.

³⁷ Michael T. Klare, *Resource Wars: The New Landscape of Global Conflict* (New York: Metropolitan Books, 2001).

³⁸ These figures are from Michael Renner, *The Anatomy of Resource Wars*, Worldwatch Paper 162 (Washington, DC: Worldwatch Institute, October 2002). Key pieces of literature in this field include, among others: Klare, op. cit. note [21]; Mats Berdal and David M. Malone, eds., *Greed and Grievance: Economic Agendas in Civil Wars* (Boulder, CO: Lynne Rienner Publishers, 2000); Karen Ballentine and Jake Sherman, eds., *The Political Economy of Armed Conflict. Beyond Greed and Grievance* (Boulder, CO: Lynne Rienner Publishers, 2003); Michael Ross, “Natural Resources and Civil Conflict: Evidence from Case Studies,” University of Michigan, Department of Political Science, 11 May 2001; Philippe Le Billon, “The Political Ecology of War: Natural Resources and Armed Conflicts,” *Political Geography*, No. 20 (2001), pp. 561-584; Ian Bannon and Paul Collier, eds., *Natural Resources and Violent Conflict: Options and Actions* (Washington, DC: World Bank, 2003); and several reports by the London-based group Global Witness.

³⁹ Renner, *The Anatomy of Resource Wars*, op. cit. note 38.

2. Elsewhere, including Sierra Leone (diamonds), Sudan (oil), and to some extent in the Democratic Republic of the Congo (a range of minerals), governments or armed groups initiated violence as a way to seize control of a coveted resource.
3. Commercial resource extraction and large-scale infrastructure projects (such as dams) can also be a source of conflict where governance is undemocratic and corrupt. The economic benefits typically accrue only to a small domestic elite and to multinational companies and their shareholders, while the local population (most often poorer communities, minority groups, and indigenous peoples) shoulders an array of social, health, and environmental burdens. Often, it is indigenous communities that are confronted by the operations of oil, mining, and logging firms. Examples include Nigeria's Niger Delta (oil), Indonesia's Aceh and West Papua provinces (oil, gas, gold, timber), Papua New Guinea's Bougainville island (copper), India (dam-building for irrigation), and Guatemala (dam-building for power generation).⁴⁰

Some analysts have argued that it is either resource wealth or resource scarcity, but not both, that gives rise to conflict.⁴¹ But this is a false dichotomy, hewing more to the purity of academic theory than allowing for the world's many complexities and contradictions. Where resource wealth is a factor in conflicts, it is primarily non-renewable resources such as fuels and minerals that are at issue (though a nominally renewable one, such as timber, is important as well). On the other hand, where resource scarcity is a factor, it concerns principally resources that cannot be looted and traded, such as farmland and water.

Still, conditions of resource wealth often co-exist with conditions of depletion and deprivation. For instance, the operation of a copper mine on the Pacific island of Bougainville, Papua New Guinea, in the 1970s and 1980s caused such massive damage (contaminated rivers and decimated crop harvests) while the economic benefits accrued primarily to the central government and foreign investors that the native population decided to launch a sabotage campaign against the mine. This developed into a full-fledged guerrilla war that shut down the mine and lasted for several years. Although secessionist aspirations had existed on Bougainville, these only rose to the forefront (the guerrilla front declared independence in 1990) after the environmental devastation had triggered hostilities.⁴²

In Nigeria's Niger Delta, rich oil deposits have generated revenues on the order of \$300 billion over the last few decades. Yet not only have the Delta communities been bypassed by this wealth generation because of largely unrepresentative and corrupt government (crushing poverty is the defining reality of the region), but they have also actively suffered from rapacious oil extraction. Their fields and fishing grounds have been polluted by leaky pipelines and the practice of flaring off natural gas found in conjunction with oil, and human health is impaired.⁴³

⁴⁰ Examples are discussed and sourced in Ibid, op. cit. note 38, and in Renner, *Fighting for Survival*, op. cit. note 22. Guatemala from Barbara Rose Johnston, "Harnessing Wild Rivers: Who Pays the Price?" in *State of the World 2005*, op. cit. note 14, pp. 92-93.

⁴¹ Indra de Soysa, "The Resource Curse: Are Civil Wars Driven by Rapacity or Paucity?" in Mats Berdal and David M. Maline, eds., *Greed and Grievance: Economic Agendas in Civil Wars* (Boulder, CO: Lynne Rienner Publishers, 2000).

⁴² Volker Böge, *Bougainville: A 'Classical' Environmental Conflict?*, Occasional Paper No. 3, Environment and Conflicts Project (ENCOP), Bern, Switzerland, October 1992; Conciliation Resources, *Accord*, No. 12/2002, special issue on "Weaving Consensus: The Papua New Guinea-Bougainville Peace Process," www.c-r.org/accord/boug/accord12/index.shtml.

⁴³ Human Rights Watch, *The Price of Oil: Corporate Responsibility and Human Rights Violations in Nigeria's Oil Producing Communities* (New York: January 1999); Global Exchange and Essential Action, *Oil for Nothing: Multinational Corporations, Environmental Destruction, Death and Impunity in the Niger Delta* (San Francisco, CA and Washington, DC: January 2000); Amnesty International, "Ten Years On: Injustice and Violence Haunt the Oil

5. Environmental Impacts of War and War Preparation

While much attention has been devoted to the complex relationship between environmental breakdown and conflict dynamics, there are also important connections in the reverse direction: warfare and war preparation impose a range of environmental costs.

a. Environmental Impacts of War Preparation⁴⁴

The maintenance of military bases and installations, the production, testing, and upkeep of conventional, chemical, and nuclear arms, and the training of armed forces consumes substantial amounts of energy, generates large quantities of toxic and radioactive wastes, contributes to air pollution and global warming, and imposes a heavy toll on often fragile land.

The maintenance of modern weapons systems and military bases entails the use of large quantities of toxic materials and wastes. In the United States, for example, it was estimated that the armed forces generated about half a million tons of toxic wastes (stemming from fuels, paints, solvents, propellants, explosives, etc.) annually during the 1990s. Negligent handling of such dangerous materials during the decades of the Cold War resulted in more than 17,000 contaminated sites on 1,855 U.S. military bases.

Producing and maintaining nuclear arsenals also entails tremendous environmental and human health costs. In the United States, more than 3,200 individual sites were identified after the end of the Cold War as having soil and/or groundwater tainted by radioactive contamination. These waste and contamination problems are matched by those found in the former Soviet Union.

The world's armed forces control large expanses of land. While some areas, off limits to the general public, have thrived as wildlife refuges, land used for weapons testing and military manoeuvres suffer tremendous degradation and pollution. Manoeuvres demolish the natural vegetation and compact and erode soil. Bombing and shooting ranges leave behind a wasteland contaminated and littered with unexploded ammunitions.

When weapons and ammunitions become obsolete—either because of changed political and military circumstances or due to the passage of time—the surplus stocks need to be decommissioned. Surplus arms were long incinerated, exploded, or simply jettisoned without much thought as to the release of toxic materials. For instance, conventional munitions and chemical weapons were dumped at sea on a massive scale after World War II, a practice that is now outlawed.

In the aftermath of the Cold War, environmental concerns received far greater attention in disarmament efforts, particularly with regard to the (ongoing) task of chemical weapons disarmament in the United States and Russia. The decontamination of military bases and arms production sites and the proper handling and storage of chemical and nuclear weapons-related materials will ultimately cost hundreds of billions of dollars worldwide. (But the most severely polluted sites may simply have to be kept off limits to human use.)

Delta," 3 November 2005), web.amnesty.org/library/index/engaf440222005; Michael Peel, *Crisis in the Niger Delta: How Failures of Transparency and Accountability are Destroying the Region*, Briefing Paper AFP BP 05/02, Chatham House, July 2005.

⁴⁴ This section is based on Michael Renner, "Assessing the Military's War on the Environment," in Lester R. Brown et al., *State of the World 1991* (New York: W.W. Norton, 1991), pp. 132-152, and on Michael Renner, "Cleaning Up After the Arms Race," in Lester R. Brown et al., *State of the World 1994* (New York: W.W. Norton, January 1994), pp. 137-155.

b. Environmental Impacts of Armed Conflict⁴⁵

Inevitably, armed conflict causes considerable damage to the natural environment. In recent years, the United Nations Environment Programme (UNEP) has shed much-needed light on the broad array of impacts in a number of conflict areas. UNEP's Post-Conflict Assessment Unit has undertaken both field research and desk studies concerning Afghanistan, Albania, Bosnia-Herzegovina, Kosovo, Serbia and Montenegro, Macedonia, Iraq, Liberia, and the Occupied Palestinian Territories.⁴⁶ Much environmental degradation caused by armed conflict is unintentional, but some of it is deliberate.

Armed conflict often involves the intentional destruction of fields or forests to deny enemy forces access to water, food, feed, construction materials. Denying an adversary cover or sanctuary, forests have been devastated by a variety of means in wars: spraying with herbicides (Vietnam War), use of heavy tractors equipped with special forest-clearing blades, saturation bombing, and setting of self-propagating wild fires. Landmines and unexploded ammunitions have pernicious impacts on the rural human environment.

A number of important rivers flow through more than one sovereign state, providing an opportunity for an upstream belligerent to divert or befoul the waters before they reach a downstream enemy with which it is engaged in armed conflict, a potentially major social and environmental calamity in an arid region. During the 1991 Gulf War, Turkey threatened to cut off the flow of water from the Tigris River into Iraq, but ultimately did not carry out its threat.

Environmental warfare entails the manipulation of the natural or built environment for hostile military purposes. Attacks may be carried out (and in some cases have been carried out) with the intent of releasing dangerous pent-up forces as a de facto weapon against fresh-water impoundments (during the Sino-Japanese War of 1937-1945, World War II, and the Korean War); nuclear power stations (resulting in the release of radioactive elements); and industrial facilities that could release dangerous chemicals.

During the Gulf War of 1991, Iraqi forces set hundreds of oil wells ablaze (some of which burned for as long as eight months) and released huge amounts of oil into the Gulf waters for hostile purposes. During that same war and in the course of other conflicts such as the 1999 Kosovo War, U.S. and NATO forces attacked refineries, petrochemical plants and other industrial facilities, leading to the release of substantial quantities of toxic materials. And the massive movement of troops and equipment in the Gulf War imperilled an already fragile desert environment.

Over time, the environmental impact of warfare has grown, as technology has boosted the firepower and range of weapons. Any use of biological, chemical or nuclear weapons would likely have an extraordinarily severe impact on the environment. But concern is not limited to wars fought with sophisticated weapons. Low-tech "civil" wars can also have devastating impacts. In fact, many recent resource-related conflicts took place in some of the world's biodiversity hotspots and other areas of great environmental value, in the Democratic Republic of the Congo, Indonesia, Colombia, and other countries.

As noted earlier, lucrative natural resources have attracted a range of armed groups, who have engaged in rapacious resource extraction. Because such activities are carried out illegally, and because loggers and miners are intent on extracting resources before they might lose control over a resource -rich area, they have no incentive to conduct their

⁴⁵ Warwick A. Fox, Michael Renner, and Arthur H. Westing, "Environmental Degradation as Both a Consequence and Cause of Armed Conflict," *Environmental Awareness*, Vol. 25, No. 1 (January-March 2002), pp. 5-19. Also available online, World Future Society, www.wfs.org/fox.htm.

⁴⁶ UNEP Post-Conflict Branch, at postconflict.unep.ch/index.htm.

operations in a responsible manner. Their primary interest is in raising funds for weapons purchases or self-enrichment and they try to extract as much, and as fast, as possible. This translates into tremendous environmental devastation.

Forests, jungles, and wetlands are also sometimes the setting for ongoing battles between rival forces. Additional stress is placed on such areas due to the influx of refugees. For example, the Rwandan civil war of 1990–94 spilled over into neighbouring Zaïre (now the Democratic Republic of the Congo), with both sides conducting military operations in the Virunga National Park area. The military presence in the forest kept growing, landmines were laid, poachers decimated wildlife, and vegetation was cut down.

Following the Rwandan genocide, nearly 2 million people left Rwanda in a sudden, massive outflow in July 1994; half went to eastern Zaïre and settled mostly on the edge of Virunga Park or inside it. Desperate for firewood, the refugees cut and gathered as much as 1,000 tons of wood a day, causing serious deforestation. Over a period of 27 months, a total of 113 square kilometres of forestland was affected; of that, 75 square kilometres were clear cut. The subsequent Congolese civil wars imposed additional burdens on Congo's national parks—Kahuzi-Biega, Salonga, Virunga, Maiko, Garamba—and the Okapi Wildlife Reserve, driving elephant and eastern lowland gorilla populations to near-extinction.⁴⁷

6. Promoting New Ways of Peacemaking

As the discussion so far has suggested, there are multiple negative feedback loops connecting environment and security. However, in principle there is no reason why environment could not be connected with security in a positive manner. On the basis of shared environmental needs and interests, cooperation is possible among different communities and countries that are otherwise locked into relationships marked by suspicion and hostility.

a. Promoting Peace through Environmental Cooperation⁴⁸

Environmental challenges ignore political boundaries, require a long-term perspective, and encourage and necessitate participation by civil society. These are characteristics that lend themselves to transforming conflict and building peace.

Environmental cooperation can enhance mutual trust (by establishing pragmatic, working-level contacts across political divides); establish cooperative habits (among governments as well as at the society-to-society level); create common regional identities around shared resources; and thus over time helping to generate a new dynamic that could sustain broader peacemaking efforts.

There is indeed a growing array of initiatives worldwide that seek to promote what might be called “environmental peacemaking.” They include peace parks straddling international borders, shared river basin management plans, regional seas agreements, and joint environmental monitoring programs. Establishing conservation zones along the contested border between Peru and Ecuador was an important ingredient in settling the

⁴⁷ José Kalpers, *Volcanoes Under Siege: Impact of a Decade of Armed Conflict in the Virungas* (Washington, DC: Biodiversity Support Program, 2001); Terese Hart and Robert Mwinyihali, *Armed Conflict and Biodiversity in Sub-Saharan Africa: The Case of the Democratic Republic of Congo (DRC)* (Washington, DC: Biodiversity Support Program, 2001).

⁴⁸ This section is based on Ken Conca, Alexander Carius, and Geoffrey D. Dabelko, “Building Peace Through Environmental Cooperation,” in *State of the World 2005*, op. cit. note 14, pp. 144–157. For a more detailed discussion, see Ken Conca and Geoffrey D. Dabelko, eds., *Environmental Peacemaking* (Washington, DC, Baltimore, and London: Woodrow Wilson Center Press and Johns Hopkins University Press, 2002).

armed conflict between the two South American nations. In southern Africa, a joint water commission in the Okavango River Basin among Angola, Namibia, and Botswana is helping to manage these countries' incompatible water use plans and thus to reduce the likelihood of conflict. And in the southern Caucasus, environmental issues may provide a way for the states in this conflict-ridden region (Georgia, Armenia, and Azerbaijan) to cooperate.

There is thus some evidence that environmental protection and restoration may be one of the few topics around which ongoing dialogue can be maintained among adversaries. But far more study is required to fully understand the opportunities and obstacles for such initiatives. To date, they have received relatively little attention.

b. Promoting Peace through Joint Humanitarian Action⁴⁹

Environmental protection is ultimately in everyone's interest, but this is a realization that is often concealed by short-term interests. As mentioned earlier, environmental degradation is increasingly translating into more frequent and more devastating natural disasters such as storms, floods, and droughts. In other cases, it weakens the integrity of ecosystems that provide protection against the impact of disasters.

Although disaster prevention is of course the preferable course, disasters sometimes do entail a silver lining. A disaster may inflict suffering that cuts across the divides of human conflict, prompting common relief needs and making protagonists realize that reconciliation is essential for reconstruction and recovery. A prominent example is Indonesia's Aceh province after the December 2004 tsunami. It triggered a new mood of reconciliation that allowed the 29-year conflict there to be brought to an end in 2005.

Still, disasters do not automatically translate into cooperation (and, as developments in Sri Lanka—which was also hit hard by the Indian Ocean tsunami—show, post-disaster dynamics could even rekindle a conflict, if the complex issues are not handled well⁵⁰). Smaller-scale disasters or slow-onset disasters may not generate the sudden jolt necessary to transform conflict dynamics. Political leaders may not possess the courage or wisdom to break with deeply-ingrained conflict patterns. Quarrels could even sharpen in the wake of disasters, particularly over the distribution of relief aid. Finally, some types of disasters, such as droughts, exhibit characteristics that are less conducive to peacemaking (disputes over scarce land and water between different communities may gain precedence over common interests).

Both environmental and humanitarian peacemaking thus need active, visionary political leadership in order to be translated from theoretical opportunity to real-world breakthrough.

* * *

As this brief review suggests, there are a multitude of connections among environment, resources, security, conflict, and peacemaking. Some of these links have received far more attention—from academics, NGOs, the media, and policy-makers—than others. Even where governments have not advertently or intentionally addressed the topic of environmental security, a range of relevant policy actions are developing and a variety of on-going practical governmental and non-governmental programmes and projects are having a noticeable impact on improving the interplay between environment and security in many critical areas in the world.

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⁴⁹ Renner and Chafe, "Turning Disasters into Peacemaking Opportunities," op. cit. note 36.

⁵⁰ Jonathan Goodhand and Bart Klem, with Dilrukshi Fonseka, S.I. Keethaponcalan, and Shonali Sardesai, "Aid, Conflict and Peacebuilding in Sri Lanka, 2000 – 2005," August 2005, available at www.asiafoundation.org/Locations/srilanka_publications.html.