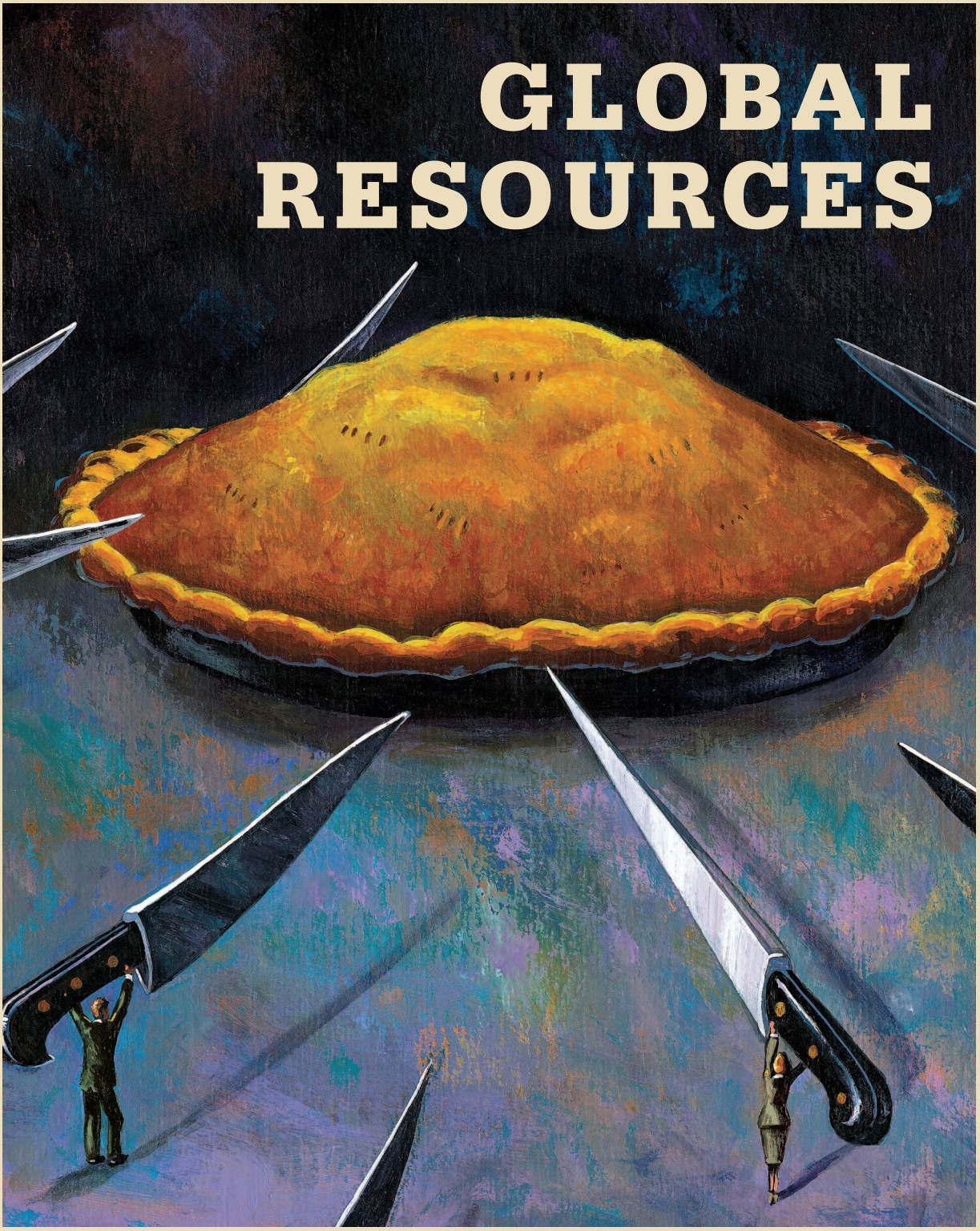


Stephen F. Hayes/Artville

ABUSE, SCARCITY, AND INSECURITY

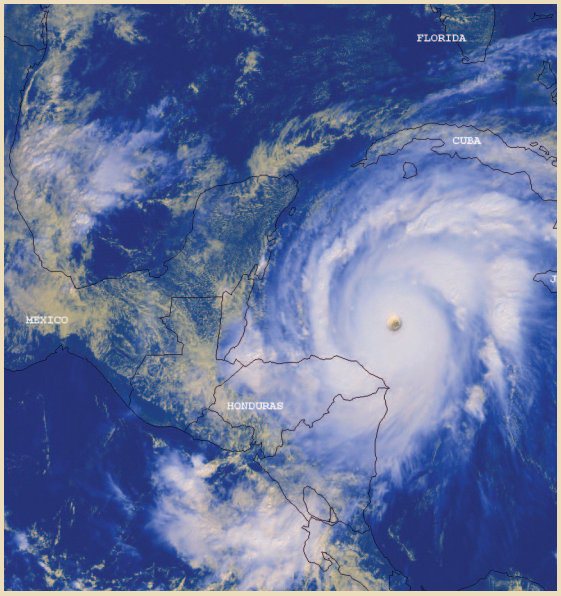
Central America has always been prone to earthquakes and hurricanes, but when Hurricane Mitch struck in October 1998, the countries of the region were paralyzed by a scale of destruction that seemed, to many, unbelievable. The storm caused more than 10,000 deaths; according to *Conserving the Peace: Resources, Livelihoods and Security*, a 2003 collection of case studies published by the International Institute for Sustainable Development, the subsequent flooding and landslides wiped out more than 2,000 potable water systems in Honduras and Nicaragua alone, left millions without dependable drinking water, and forced 2 million people from their homes. Crowded shelters created unsanitary conditions and fueled the spread of diseases such as dengue. The disaster stretched national governments to the brink of failure.

Analysts found that the natural disaster was vaulted to the status of unprecedented catastrophe by decades of conflict involving deforestation, erosive farming, and land use changes, and the resettlement of hundreds of thousands of people in the wake of civil wars in Guatemala and El Salvador placed large populations in rural areas that were prone to flooding. All of these factors together weakened the region's mountainous landscapes and made them vulnerable to landslides and exceptionally destructive flooding.

Wages of war? Decades of conflict plus one natural disaster spells chaos.

Debbie Larson/NOAA

Until recently, little consideration has gone into the link between environmental policy and security, despite the fact that the stakes for both are often similar. As Tulane University law professor Eric Dannenmaier noted in the 2001 policy paper *Environmental Security and Governance in the Americas*, if a foreign plot threatened to poison a city's water supply or pollute an entire river, that nation's security forces would react quickly—but when a slower-moving but more predictable



Setting the stage for disaster. Decades of conflict weakened Central American lands to the point that when Hurricane Mitch hit in 1998, the infrastructural and human health effects were apocalyptic.

threat to environmental security is at work, governments are unlikely to bring the same force to bear.

In the past decade, however, a conceptual framework has emerged for considering the goals of sustainable environmental management together with concerns for national security. The real question, according to Dannenmaier, is how planners can consider long-term environmental interventions strategically to avert security threats. In the past, he says, the defense community became concerned with environmental stressors only when their consequences reached the level where they led to violent conflict. But as the damage wrought by Hurricane Mitch suggests, by addressing tensions related to resource management earlier, governments may avoid more expensive and drastic responses later.

Today, a new kind of natural resource analysis has assumed priority in quarters that might once have surprised environmental managers. A growing body of literature suggests that rights to use resources such as land and water can sometimes be central to understanding the dynamics of national and regional security. In a variation on the dictum "follow the money," development planners are saying "follow the cracks in the landscape"—and they are finding that what appear at first glance to be strictly political tensions are often, in fact, rooted in environmental strains.

Change in an uncertain world. Today, children play on an abandoned ship at what was once the edge of the Aral Sea. Unsustainable environmental manipulation and mismanagement of resources has left many former Soviet republics pressed for water.

Shift in Thinking

When the Cold War ended and the dynamics of superpower geopolitics began shifting, officials grappled with identifying the new forces that shaped global and regional stability. Intelligence officials found that many young democracies relied relatively heavily on rural economies, and in those places national security was particularly vulnerable to instability caused by conflicts over natural resources. "It was like unraveling a ball of yarn," recalls Darci Glass-Royal, cofounder of the Foundation for Environmental Security & Sustainability (FESS), a private nonprofit organization outside Washington, D.C. "It's all connected."

Water issues in the former Soviet Union gained new prominence, for example. In support of an ill-conceived idea of growing water-hungry cotton in the arid high-desert climate of Central Asia, the Cold War giant had built an elaborate irrigation infrastructure linking the arid Central Asian republics. But the system was not maintained; with the dissolution of the Soviet Union, there was no longer any central coordination at all. Water distribution faltered, while sources became salinized. Today, access to water remains a key factor in Central Asian security.

The 1997 establishment of the Central Intelligence Agency (CIA) Director of Central Intelligence Environment Center (whose duties have since been folded back into the agency's Office of Transnational Issues) signaled a growing concern among U.S. security officials with issues such as land use, water rights, and the impact of the environment on the spread of infectious

Clockwise from top left: Debbie Larson/NOAA; NOAA; Paul Lowe/Panos Pictures

diseases. The center's intelligence experts set out to look at regional security relationships in a new way: In a given region, what are the ongoing environmental stresses? What is a country's capacity for coping with those stresses—how will its health infrastructure, for example, respond to a disease epidemic? Could field clinics report outbreaks to a central office quickly, how would vaccine stocks be mobilized, and what factors might hamper accurate reporting (such as economic pressures to not report outbreaks in popular tourist areas)? What might happen if the population pressures of that society overwhelmed its environmental capacity?

By the same token, environmental scientists have begun to realize that information held as classified by security officials can be useful in understanding natural resource dynamics. Satellite images gathered by intelligence agencies are often of higher resolution than images in the public domain. In some cases, such information might be made publicly available without compromising national security.

Early in the Clinton administration, through an agreement with the CIA director, a program called MEDEA began to make available classified material for screening by U.S. environmental scientists with appropriate security clearances, so that they could identify potentially useful data. According to Michael McElroy, Gilbert Butler Professor of Environmental Studies at Harvard and former chair of MEDEA, the program scored accomplishments that included the release of temperature data for the Arctic Ocean, which is important in global climate change studies and which for decades, had been held only by the U.S. and Soviet navies. (The program eventually was shut down after the 2000 presidential election because it was seen as a pet project of former vice president Al Gore.)

Environmental planners have also found methodologies from intelligence to be useful for identifying resource stress points. At FESS, Glass-Royal and colleagues have conducted environmental security assessments for various government agencies. Such an assessment starts with a snapshot of a region's environmental baseline and overlays more in-depth analysis of key economic and security factors. In Nepal, such a study included problems that environmental managers have long known about (such as deforestation, population pressures as available land holdings are increasingly divided among successive generations, and disputes between Nepal and neighboring India over water rights), but also activities that many environmental agencies might consider beyond their sphere. Nepal's Maoist insurgent movement, for instance, has apparently funded rebel activities with profits from products such as marijuana and medicinal herbs harvested in forest lands.

The Nature of the Threat

Experts confess that they have few statistics that adequately characterize the complex relationships between security concerns and management of natural resources, but some figures hint at the dimensions. One natural resource that is increasingly scarce and likely to trigger tensions worldwide is fresh water. Less than 3% of the world's water is fresh, and most of that is frozen in ice caps and glaciers. Humankind already uses nearly half of the accessible runoff from lakes, rivers, and aquifers, according to the World Resources Institute, and growing demand

Dermot Tatlow/Panos Pictures

Exploitation to fund the fight. Military, police, and rebel forces such as these Maoist insurgents often fund their activities by exploiting natural resources, such as timber and other salables grown on forest lands.

Resources on Conflict and the Environment

Beyond the International Year of Mountains: Conflict
International Partnership for Sustainable Development in Mountain Regions
http://www.mountains2002.org/issues/i-conflict.html
Explains why most wars and armed conflicts take place in the world's highlands, and how conflict affects mountainous regions.

Bishkek Global Mountain Summit: Conflicts and Peace in Mountain Areas
Mountain Forum
http://www.mtnforum.org/bgms/paperc2.htm
E-conference debate explores examples of and specific issues related to conflict in mountainous regions.

East Asia and Pacific Environmental Initiative: Conflict and the Environment
U.S. Agency for International Development/U.S. State Department
http://eapei.home.att.net/Links/conflictlinks.htm
Summarizes and links to a wealth of online resources related to conflict and the environment.

Environmental Change and Security Project
Woodrow Wilson International Center for Scholars
http://wwics.si.edu/index.cfm?fuseaction=topics.home&topic_id=1413
Explores the connections among natural resource scarcity, conflict, human insecurity, and foreign policy.

Forest and Poverty Mapping in South Asia
World Conservation Monitoring Centre/United Nations Environment Programme
http://www.wcmc.org.uk/forest/poverty/index.htm
Lets users customize maps showing forest cover and indicators of poverty and population pressure in South Asian countries.

Global Atlas of Infectious Diseases
World Health Organization
http://globalatlas.who.int/
Combines standardized data and statistics for infectious diseases at the country, regional, and global level, allowing for analysis and comparison.

Global Environmental Change and Human Security Project
University of California, Irvine
http://www.gechs.uci.edu/
Explores how environmental change affects the lives and welfare of individuals and groups around the world, especially in developing countries.

Inventory of Conflict and Environment
American University
http://www.american.edu/TED/ice/ice.htm
Categorizes narrative case studies by topic, region, and period of history, allowing policy makers to review case studies that might be comparable to emerging problems and glean guidance for performing initial assessments.

ReliefWeb MapCentre
United Nations Office for the Coordination of Humanitarian Affairs
http://www.reliefweb.int/w/map.nsf/home?openForm
Offers maps of disaster sites, with links to relevant reports.

United Nations Environment Network
United Nations Environment Programme
http://www.unep.net/
Categorizes authoritative environmental information by theme and region.

for water is expected to exceed supply well before 2025.

Other telling figures lie in the interrelated factors of the environment, refugees, and conflict. The Washington, D.C.–based Worldwatch Institute estimates in its booklet *Vital Signs 2003* that environmental disasters are responsible for nearly 60% of the world's 43 million refugees. During famine, drought, or flooding, whole populations are forced from their homes to seek refuge elsewhere. Once in a new place, their immediate concerns for survival—food, water, and shelter—override concerns about wise environmental management. This can spur a cycle of resource degradation and conflict.

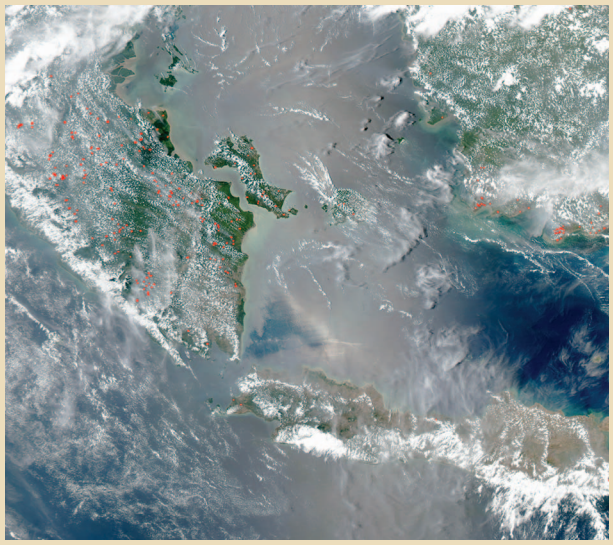
In late 1996, for example, when more than 600,000 refugees from Rwanda and Burundi arrived in northwest Tanzania, they consumed more than 200 metric tons of firewood every day, according to the United Nations Environment Programme (UNEP). The resulting deforestation affected an area of 570 square kilometers. UNEP has estimated that environmental rehabilitation of refugee camps in Africa alone, which has roughly one-sixth of the world's refugees, could cost up to US$150 million each year.

Although much is still unknown about the relationships between scarcity and conflict, experts are beginning to elucidate some patterns. Richard Matthew, an associate professor of international and environmental politics at the University of California, Irvine, performed a series of case studies for *Conserving the Peace* in which he environmental security issues from various perspectives. Within those case studies, he distills the relationships down to a few basic scenarios: unsustainable use of resources, inequitable access to resources, use of resources to finance conflict, and incompatible uses leading to conflict.

Scenarios of Desperation

Forests are one resource that figures in to at least two of the scenarios described by Matthew. Consider the problem of inequitable access. According to the World Bank, forests worldwide contribute directly to the livelihood of 90% of the world's poorest 1.2 billion people, and where rules governing these people's access to nearby forests are unclear—for example, when people who have for generations collected firewood or fruit from a nearby forest are confronted with new laws that ignore that traditional access—researchers have found serious threats to health and stability.

For example, in 1997–1998, Indonesian officials estimate, fires scorched more than 300,000 hectares of forest and plantations



Far-reaching effects of unsustainability. National policies sometimes encourage poor stewardship of natural resources. For example, land use laws in Indonesia helped spur the 1997–1998 burning of thousands of hectares of forest land. The resulting pollution ultimately affected millions of people, many beyond Indonesia's own borders.

on the islands of Borneo and Sumatra. In health terms, the fires destroyed delicate ecosystems, forfeited unknown treasures of biodiversity, and blanketed much of Southeast Asia with a thick haze. The World Wide Fund for Nature estimates that the haze affected the health of as many as 75 million people in six countries, with perhaps 40,000 people hospitalized for respiratory and other pollution-related ailments such as asthma, bronchitis, pneumonia, and eye and skin problems.

The Center for International Forestry Research (CIFOR), an intergovernmental research organization in Indonesia, found that inequitable tenure and access to land was a major underlying cause of the fires. Yet the motive behind the fires was not simply revenge of the disenfranchised. "Reasons are often more pragmatic than just to vent feelings of injustice," notes Unna Chokkalingam, coauthor of the 2000 CIFOR report *The Underlying Causes and Impacts of Fires in South-east Asia*. Under Indonesian law, communities and farm families can gain use of cleared land or farmland much more easily than land that is covered by natural forests. Other countries have similar policies that effectively discourage responsible stewardship, says Chokkalingam, yet governments often resist changing the policies, due either to vested interests in the existing claims on resources or to political inertia.

Forest products also can be used to fund conflict. Forests are often claimed by powerful interests because the global trade in forest products is an estimated US$150 billion per year, according to *Conflict Timber: Dimensions of the Problem in Asia and Africa*, a 2003 report commissioned by the U.S. Agency for International Development (USAID). The authors observe that timber can be harvested and converted to cash more cheaply than oil (which requires more expensive technology for refining and infrastructure for transport), producing high returns on little investment. Control over timber resources can thus shift the balance of power in a conflict and affect its duration. As it is, according to *Conflict Timber*, an underfunded army often has tacit approval to abuse its powers in order to finance itself. As Worldwatch Institute senior researcher Michael Renner notes in the 2002 report *The Anatomy of Resource Wars*, illegally cut timber has been used to fund conflicts in countries including Cambodia, Burma, and Liberia. In each of those three countries, Renner states, such timber sales in the 1990s were estimated at more than US$100 million per year.

Other scenarios play out around the world, with other resources. Paul Barker, country director for Afghanistan for the humanitarian group CARE International, finds that in that country's current unstable

Aiding and abetting—but at what cost? The cultivation of opium poppies to fund private warlord activities in Afghanistan is a destabilizing force for local farmers.

Clockwise from top left: Dermot Tatlow/Panos Pictures; NASA; Robert Knoth/Panos Pictures

atmosphere, unregulated drilling of deep wells defies coherent resource management. The wealthy can afford to drill deeper wells, and when they draw water, it lowers the aquifer level below the reach of shallower wells dug by poor communities. Unregulated drilling also compounds a multiyear drought. But in Barker's view, the farmland production of opium poppies, which in turn funds the private armies of warlords, poses an even greater threat to security [for more details on the state of Afghanistan's postconflict environment, see "Environmental Triage in Afghanistan," *EHP* 111:A470–A473].

Development workers are still learning how the security framework corresponds to their own experiences. Elizabeth Byers and her husband, Alton, were working on development projects near a mountain park in Rwanda just before violence first erupted there in mid-1988. "We felt the undercurrents," says Byers, now a senior program officer with the nonprofit Mountain Institute. She saw poor groups being forced onto marginal soils and the cycle of inequality and poverty that was degrading the land. Farm households in Rwanda's mountains were often resettled from flatter areas onto small plots of less than 1 hectare of steeply sloping land. Imbalanced gender rights compounded the poverty cycle—at that time, Rwandan women were pressured to marry early and had an incredibly high average of 14 live births. Byers calls the plight of women with very few rights, combined with a fast-growing population and conflict over farmland, "a formula for disaster."

Ultimately, this formula for disaster made good on its promise. Between April and August 1994, an estimated 1 million Rwandans were massacred, and 2 million more fled as refugees. At the time, the genocide was often presented by the media in the simplified terms of ethnic conflict between the Hutu majority and Tutsi minority. However, recent analyses by James Gasana, who served as Rwanda's minister of agriculture and environment before the 1994 genocide and authored a study in *Conserving the Peace*, show that inequitable access to farmland based on ethnicity and resulting erosion in that mountainous country played a crucial role in the struggle. The ethnic tension was the fuse, not the explosive.

Paths To Stability

In October 2003, ministers of defense and foreign affairs representing the 34 member countries of the Organization of American States acknowledged the importance of wise environmental management for improved security throughout the Americas. They adopted the joint Declaration on Security in the Americas, which repeatedly identified environmental degradation as a potential threat to the security of member states. According to Glass-Royal, such high-profile declarations can give donor organizations such as UNEP and the UN Development Programme a mandate for funding regional activities in environmental security.

The CIA and the Defense Department continue to look for ways to reduce or anticipate environment-related tensions. In their normal training of border patrols that monitor territorial waters, for example, they are adding instructions on

The burden of refugees. When whole peoples are turned out of their homes, their first priority, understandably, is finding enough food, shelter, water, and fuel to survive. As a result of the scramble to secure the necessities of life, remediation of refugee camps can cost hundreds of millions of dollars.

Howard Davies/Panos Pictures

how to watch for trawlers that are overfishing piscine stocks and how to be alert to illegal waste dumping.

USAID has incorporated environmental security into its framework for understanding the dynamics that affect human well-being. According to Tim Resch, manager of USAID's East Asia and Pacific Environmental Initiative, the agency is beginning to look at how to protect biodiversity in times of crisis, including both natural and anthropogenic disasters. Some of the agency's considerations reflect a widening scope of thinking. The authors of *Conflict Timber* recommended, among other things, that the Indonesian national budget contain allocations for the Indonesian military and police forces that have in the past logged forests to fund their activities. The authors argued that this would reduce the Indonesian military's pressure on forests and relieve military and police forces of the need to raise two-thirds of their operating budget from their own economic enterprises.

Resch confirms that USAID and other agencies have discussed how the military is funded and the need for training for military and police forces in better resource management. "Part of it," he says, "is 'daylighting'—making information publicly available." Despite tacit approval of such tactics, governments and revolutionaries may lose credibility if they are seen as plundering natural resources to fuel their cause.

Matthew says that each case has to be addressed on its own conditions. He does suggest that giving soldiers a stake in better environmental management can make them more careful stewards of the resource.

Matthew also notes that environmental interventions planned without an awareness of security factors can be counterproductive. One thing he discovered during his *Conserving the Peace* case studies that surprised and disturbed him was that "certain types of conservation strategies can actually intensify the conditions for conflict." Creating a national park under the wrong conditions—for example, siting it directly in the path of growing populations and farmland expansion—could remove a buffer zone that might otherwise defuse tensions between groups. Strategically located "peace parks," on the other hand, could give groups strategic breathing room. With the right structural incentives, such peace parks could also give the groups involved common cause for preserving the ecosystem.

Processes for so-called alternative dispute resolution (ADR) offer further hope for defusing resource-related tensions. Jeffrey Senger, who is senior counsel in the Department of Justice Office of Dispute Resolution and author of the 2003 book *Federal Dispute Resolution: Using ADR with the United States Government*, notes that resource-related disputes are good candidates for ADR, which refers to ways of resolving disputes without resorting to litigation, usually with the help of a neutral mediator. This is partly because resource disputes can be so complex and expensive to litigate, and partly because they often involve parties who will have to deal with each other long after the case is settled. Where litigation can destroy long-term relationships, mediation can build a basis for collaboration. With support from the State Department, Senger has traveled to conduct courses for judges and political leaders in India, Turkey, the Middle East, and Argentina [for more information on ADR, see "Finding Middle Ground: Environmental Conflict Resolution," *EHP* 111:A650–A652].

Early anticipation of resource-related hot spots has become a priority for environment and development planners at the World Bank and the UN. These professionals are using field-based research, satellite imagery, and other tools to identify areas where scarce or unstable natural resources can fuel instability. Map-based applications already used in UN programs include a database of coastal border information, an early warning system on food and agricultural crises, the World Health Organization's online Global Atlas of Infectious Diseases, and the ReliefWeb MapCentre (see the table on p. A172 for more information on these and other resources).

Matthew says that a second phase of case studies supported by the World Conservation Union and the International Institute for Sustainable Deveopment is examining global hot spots of environmental security, including western and southern Africa and South Asia (India, Pakistan, Bangladesh, Sri Lanka, and Nepal). Besides having two nuclear powers, looming problems of environmental capacity, and sustained population growth, South Asia is also likely to be directly affected by global climate change.

World Bank chief scientist Robert Watson concurs, saying that sea level rise alone will force huge population displacements in Bangladesh, and cause crucial farmland and fresh water to become scarce. If the ocean level rises by one meter, as predicted for this century, Watson warns that "half of the rice produced in the deltaic area of Bangladesh could be lost." Other regions can expect similar scarcities.

Regional cooperation on environmental security can help defuse conflicts and their impact on scarce resources. Doris Capistrano, head of CIFOR's Forests and Governance Program, notes that forest-related conflicts, for example, tend to occur in remote, frontier areas where government control is weak. She says, "Cooperative efforts of neighboring countries to deal with illegal traffic of forest products—which tends to be associated with traffic of other illegal products such as arms, drugs, and valuable minerals—will help stem this flow."

Building awareness among stakeholders and pinning down the links between conflict and the environment is a priority for other groups. In January 2004, UNEP announced a new study to examine the links between the environment and human conflict. A 14 January 2004 Reuters news release quotes UNEP Division of Early Warning and Assessment director Steve Lonergan as saying the agency may establish a new secretariat on environmental peace and conflict.

Nongovernmental organizations have a role to play, as well. For example, CARE International is responding to the ongoing crisis in Afghanistan by promoting small enterprise loans, funding water and sanitation projects, and awarding grants for education and building of schools. Barker hopes these efforts will contribute to helping conserve nearby natural resources. Other groups in Afghanistan have conducted a national assessment of health care facilities and helped rebuild local clinics with provisions for potable water and wells.

Glass-Royal and her colleagues at FESS are optimistic about the world's prospects for reducing environment-spawned conflict. In the November 2003 draft report *Environmental Stress and Instability: Critical Perspectives for Conflict Assessment*, they declare that "it is possible to understand environmental issues in the political and social context of specific regions," and that identifying scenarios can help "formulate assistance strategies that can mitigate problems before they become intractable to intervention." Glass-Royal further suggests that in some situations, environmental concerns can actually provide a catalyst for national or regional talks. Shared concerns over the environmental impact of mountaineering ecotourism in Kashmir, for example, could bring the two sides of that dispute into dialog on topics that are less sensitive than national boundaries, leading to cooperation that extends beyond just the environment.

David A. Taylor