

## Networks of Threats and Vulnerability: Lessons From Environmental Security Research

Over the last 10 years, environmental security research has brought new ideas to the field of security studies; broadened our understanding of global change, conflict, and vulnerability; and explored the roles of conservation and sustainable development in promoting peace, stability, and human security. Today, another powerful new idea has emerged: national and international security agendas are focusing as much attention on “network-based threats”—terrorism, computer viruses, and epidemic diseases, for example—as

on the perennial problem of war. If researchers reorient security studies to systematically investigate these transnational dangers, policymakers might be able to devise effective evidence-based solutions to the growing number of threats that do not follow the traditional state-centered security model. And this emerging field offers new lessons for environmental security research, revealing connections between processes of global change and deepening understanding of conflict and cooperation.

What is a network-based threat? Take, for example, climate change. People make decisions about their energy use based on their immediate social, economic, and ecological surroundings. These decisions constitute an informal web—a dispersed, transnational network<sup>1</sup>—of individual behaviors that ultimately combine to produce climate change, which has become a human and national security problem with uneven impacts across the world. This is demonstrated by the increasing frequency and severity of natural disasters, such as the floods that swamped 60 percent of Bangladesh in summer 2004 (“Battle to get aid,” 2004; Logan, 2004).

Malevolent threat networks, such as global terrorism, share some structural characteristics with accidental threat networks like climate change: they are dispersed—therefore difficult to neutralize through negotiations or force—and they can accommodate and be amplified by diverse motivations. Although threat networks like climate change and global terrorism could be extremely dangerous and costly, it is hard to identify an effective mitigation policy, since no single incentive structure is likely to modify the behavior of all of a network’s nodes; the net-

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work's effects vary across time and space; and the capacity to promote change is distributed unequally among states and non-state actors.

Environmental security (ES) scholarship provides important theoretical and methodological underpinnings for the embryonic field examining these threat networks. ES literature introduced an interdisciplinary perspective into traditional security practice, promoted the incorporation of security issues into mainstream endeavors like business and engineering, and explored the interactive dynamics of the diverse human and natural networks that constitute the modern world. While the ES field does not offer a suite of all-purpose solutions to transnational security challenges, it does provide useful analytical tools based on extensive research and debate. In addition, bringing together these fields can also help correct flaws in ES research, such as lack of engagement with the broader security community.

### The New Security Landscape: Networks of Threat and Vulnerability

Most of the planet's terrain is now divided among 191 sovereign states,<sup>2</sup> many of which have achieved the security from internal conflict and external military aggression envisioned in Thomas Hobbes' seminal 1651 work, *Leviathan*.<sup>3</sup> For 300 years following 1648's Treaty of Westphalia, sovereign states aspired to self-sufficiency and viewed other states largely in terms of domination and balance. After World War II, however, these ideals were abandoned in favor of the United Nations system of formally sovereign states constrained by international law and mutually beneficial trade relations.<sup>4</sup> Michael Doyle (1983) and other scholars have argued persuasively that a "liberal zone of peace" has emerged: liberal states are democratic, respect international law, and engage in trade. They fight non-democratic states but not each other, thus creating zones of peace.

However, open democracy and trade have been a mixed blessing. Over the past several

decades, the international and transnational networks linking states have grown more numerous and more sophisticated, propelled by rapid technological innovation and diffusion (Zacher, 1992). These networks have generated wealth, knowledge, power, and cooperation in ways that have improved the lives and enhanced the security of millions of people. However, they have also introduced threats and vulnerabilities, ranging from old-fashioned religious extremism to modern computer viruses, by empowering non-state actors through unprecedented access to information, communication systems, and transportation, resulting in a technologically accelerated political condition that we describe as "hyper-medievalism."

Rather than aggregating political and economic power within a defined territory, a hyper-medieval world is highly decentralized. Multiple stakeholders—from warlords to business cartels—compete effectively with states, which may fail due to corruption or ineffective law enforcement. Technology has reduced barriers to power accumulation, accelerating the start-up phase for new power-holders and injecting high levels of turbulence into the global system (Rosenau, 1990). Speed, knowledge, mobility, and reach are great assets for legitimate businesses and scientific research projects—but also for drug traffickers, timber mafias, human smugglers, terrorists, and identity thieves.

Transnational networks are not easily dismantled or neutralized. Investigative reports by PBS and ABC concluded that the war on drugs has placed 1.5 million Americans in prison and cost hundreds of billions of tax dollars, and yet it has not made a dent in the production, transportation, sale, or use of illegal drugs, which is valued at \$300 billion to \$400 billion a year (Schaffer, n.d.; Frontline, 2000; Stossel, 2002). As soon as one trafficker is arrested, another steps in; when pressure is applied to one country, production moves to another; and vast sums of money breed corruption in law enforcement at home and abroad. After 30 years of war, the enemy—the transnational network of drug traffickers—is

larger, richer, and more powerful than ever before.

Even perfectly respectable networks pose security problems when they transmit the negative effects of their legitimate activities across national borders. For example, currency traders in one country can trigger panic selling in others, as demonstrated by Southeast Asia's "financial flu" in the 1990s. Today, epidemiologists are concerned about diseases that could jump from animals to people and move rapidly across the planet to reach large populations in a matter of hours.<sup>5</sup> The Internet, a valuable tool for individuals and groups worldwide, is also susceptible to viruses and can be used by criminals and terrorists to commit fraud, launder funds, and share information.

### **Lessons From Environmental Security Research**

The process of understanding network-based security issues, and effectively addressing them, is still in its infancy, but pioneering ES research has made significant contributions to this new field. The powerful criminal and terrorist networks that challenge security share characteristics with the benign transnational networks, such as waterways and forests, that ES researchers study.

Environmental security research brings together experts whose work initially developed along independent trajectories. Since the 1990s, social scientists, conservationists, and defense personnel have collaborated to understand the security implications of resource scarcity and abundance, environmental impacts of military activities, conservation practices' effect on conflict, and new asymmetrical conflicts at the human security level involving military or paramilitary assets.<sup>6</sup> Although unfinished, this work has generated practices and insights—like promoting interdisciplinary research and moving beyond the traditional security community—that can be applied to help understand and address other network-based security problems.

### **Promoting interdisciplinary research**

Contemporary security requires expertise beyond the traditional grasp of senior military personnel and political scientists. Networks often bring together entities that share a goal or capability but otherwise differ in substantive ways. Contemporary terrorist networks, for example, are much more inclusive than the 20th century's close-knit groups. Al Qaeda can accommodate anyone with a grievance against the United States or its allies, or who sees participation as a way to accumulate resources or advance a more local agenda. Osama bin Laden may not be able to control all al Qaeda activities, but consequently, al Qaeda can survive massive disruptions of its leadership, funding, and training grounds. Understanding the threats posed by this type of dispersed, transnational terrorist network requires a range of diverse expertise:

- Understanding motivations requires psychologists, theologians, sociologists, political scientists, and criminologists;
- Understanding how capacity (e.g., recruits, funds, weapons, information, and media attention) is amassed requires businesspeople, scientists, and information technology specialists, as well as social scientists, law enforcement personnel, and military experts;
- Understanding the realm of opportunities available for terrorists requires people familiar with the inner workings of the internet, international business, and epidemiology; and
- Attacking the root causes of terrorism and developing effective countermeasures requires interdisciplinary research on a scale unfamiliar to the security community.

### **Moving beyond the traditional security community**

Contemporary security studies should be included in business, medical, engineering, criminology, and computer science education

programs, so that specialists in these areas can examine the security implications of their practices. For example, every doctor should understand how the country is likely to respond to a lethal epidemic or chemical release, and engineers should learn how to design buildings that are less vulnerable to attack. Network-based threat analysis could provide valuable input for financial risk assessments and investment decisions,<sup>7</sup> and it could delineate the interdependence of internal and external national security problems for law enforcement and intelligence personnel.

### **Studying the dynamics of global networks: Examples**

The interactive dynamics of networks—such as the environment, the market, and global terrorism—need to be analyzed via both quantitative and comparative case study methods, as in the following examples drawn from ES research in Nepal and Pakistan.<sup>8</sup>

In 1976 the Government of Nepal established the Koshi Tappu Wildlife Reserve in the eastern part of the country. This protected wetland, which became a Ramsar Wetland of International Importance<sup>9</sup> in 1987, lies along a 24-kilometer section of the Koshi River in an area known as the Terai. A portion of the area downstream from the reserve was leased to India so it could develop a dam. Settlers moved to this region to relieve pressure on the Kathmandu Valley and create a Nepalese presence along the border with India. The settlers, who relied largely on fishing and gathering, were displaced by the reserve and the lease. Now, they must eke out an existence in a remote, resource-poor region, vulnerable to any sort of shortage.

For the past decade, Nepal has suffered a violent conflict between Maoist insurgents and the government. The Maoists are very active in the eastern part of the country, where they have promised to return the reserve's land to the local residents. This rhetoric has mobilized sympathy and support for the rebels. Some analysts consider the Maoists a terrorist group

that may be expanding its transnational links to left-wing groups in India, the Tamil Tigers in Sri Lanka, and other extremist groups in South Asia (South Asia Terrorism Portal, n.d.). Understanding the Maoists requires understanding the relationships among the world economy, which influences the Nepalese government's decisions, such as the lease to India; environmental stressors, like the migration from Kathmandu Valley and resource scarcity in the Terai; and regional strategic considerations, such as Nepal's vulnerability vis-à-vis India and, to some extent, China. Only this approach, common to ES literature, can adequately reveal the relationships that create, sustain, and strengthen a transnational threat network, and identify the pressure points for reducing the threat. In this case, improving settlers' livelihoods and legal protections, while preserving the conservation benefits through a sustainable use plan, might be a low-cost way to undermine support for the Maoists and a far more productive approach than the protected reserve.

The situation in the Dir-Kohistan region of Pakistan's North West Frontier Province provides another example of how ES research can be expanded to other transnational threat domains or used as a model for such analysis. Over 36 percent of Dir-Kohistan's 4,645 square miles is coniferous or oak scrub forest. It is one of the country's least developed areas, with an agrarian-subsistence economy, extremely low literacy rates (less than one percent for women), and little infrastructure. Traditionally, forest resources, which provide fuel wood, building materials, and other commodities, were allocated by the *nawabs*, or leaders, through a system of customary rights and principles that clearly favored the Kohistani over the region's other two ethnic groups, the Pathan and Gujar. Disputes were settled through ad hoc community councils known as the *jirga*.

In 1927 the British passed the Colonial Forest Act, which largely excluded local communities from the forests while granting some concessions to the Kohistani; Pakistan retained this legislation after independence in 1947. As



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Pakistan sought to gain control over its northern regions, the forests were largely ignored, but as their commercial value increased in the 1960s, they were leased to private contractors in return for generous royalty payments. When local people protested these terms, the government agreed to raise the community's share from 12 percent to 60 percent of the royalties. Unfortunately, due to widespread official corruption and the timber mafia's strong-arm tactics, local communities received very little as the forests were rapidly cleared in the 1970s.

In recent years, Islamic law has gained influence in Dir-Kohistan, especially among the Pathan and Gujar communities, which have adopted it in areas where they constitute a majority. Residents of Dir-Kohistan believe Islamic law is less biased than customary or statutory law and less prone to corruption. It is also more generous towards women, and thus appeals to the half of the population denied legal standing for centuries. From the perspective of many outsiders, the rise of Sharia law indicates a capitulation to Islamic extremism and creates a safe haven for Taliban and al Qaeda supporters. There is no doubt that this conflict-prone region includes some supporters of these transnational threat groups, but it is equally true that a combination of environmental scarcity, failed legal systems, and government corruption created conditions under which Islamic law became the only support system for many local residents. To successfully address threat and security issues in Dir-Kohistan, as much—if not more—attention should be given to improving sustainable livelihoods, education, and law enforcement, as to rounding up drug traffickers, offering bounties, and imposing sanctions. The security policymakers' knowledge of this region is not often based on the fine-grained field research undertaken by ES scholars. Following this trajectory might lead to more effective and less costly policies that undermine transnational terrorism by providing viable opportunities for sustainable employment and justice.

## Lessons for Environmental Security

Since the mid-17th century, and especially since World War II, the field of security studies has been constructed to investigate and help resolve the problem of interstate war. Today, transnational threat networks present as great a challenge to national and human security as war, as ES researchers argued in the 1960s, 1970s, and 1980s.<sup>10</sup> After a dramatic growth spurt in the 1990s, ES has produced a body of theoretical and methodological insights into the study of other network threats, as discussed above.<sup>11</sup>

The study of network-based threats also offers lessons *for* environmental security. For example, a full analysis of a threat system like global terrorism will probably reveal connections between the network and global environmental processes, which may lead to ideas for viable interventions. In addition, the ES literature could close some of its internal gaps by engaging the broader security community on concepts such as threat, vulnerability, conflict, and cooperation.<sup>12</sup> ES researchers often resist responding to the extensive literature on conflict and cooperation, and reduce this complex world to a meta-variable (e.g., undifferentiated “social factors”) that affects the relationship between the environment and conflict. Thus, network-based threat analysis could provide ES researchers with a way to deepen their understanding of security theories.

Over the next 10 years, as the United States and many other countries struggle to come to terms with new threats and vulnerabilities, ES research could support the development of an emerging field that may transform our understanding of human and national security, while reaping its own beneficial insights into new networks of conflict and cooperation.

## Notes

1. There is no consensus on the definition of “network” or how to distinguish it (if necessary) from “system.” Here, we use the term network in its most elemental sense: “an interconnected system of things or people” (retrieved on August 17, 2004, from Word

Net: <http://www.cogsci.princeton.edu/cgi-bin/webwn?stage=1&word=network>).

2. The United Nations (2004) has 191 members. The United States recognizes 192 states: UN members plus Taiwan (U.S. Department of State, 2004).

3. Partially inspired by England's violent civil wars, *Leviathan* envisioned the sovereign, territorially delimited state as the optimal arrangement for maximizing human security. Europe could escape the strangling grip of its royal families and the Catholic Church, Hobbes argued, only by centralizing political power and demarcating the precise territorial limits of its jurisdiction.

4. As of April 2004, 147 states belong to the World Trade Organization.

5. This possibility was demonstrated by the rapid emergence and spread of Severe Acute Respiratory Syndrome (SARS) in 2003 (Centers for Disease Control and Prevention, 2004).

6. On resource scarcity and security, see Thomas Homer-Dixon (1999); on resource abundance and security, see Gleditsch and de Soysa (1999); on the environmental impacts of the military, see Hawley (1992); on the security implications of conservation practices, see Matthew, Halle, and Switzer (2002); and on the human security implications of asymmetrical war, see Benini and Moulton (2004).

7. For example, businesses are wary of investing heavily in climate change mitigation. Training designed to accurately measure the costs of such security risks might overcome this reluctance; see "Most U.S. Industry Giants Ignoring Global Warming" (2003).

8. These examples are based on a study of livelihoods, resources rights, and conflict in Nepal, Pakistan, Bangladesh, and Sri Lanka, led by IUCN South Asia. Co-author Richard Matthew is a senior consultant for this study. Information about the project is available on the IUCN website (<http://www.iucn.org/places/asia/livelihood/index.html>) and findings will be published in an edited volume in 2005.

9. The Convention on Wetlands, signed in Ramsar, Iran, in 1971, is an intergovernmental treaty that promotes international awareness and cooperation for the conservation and wise use of wetlands and their resources; see <http://www.ramsar.org/> for more information.

10. See, for example, Ophuls (1976), Brown (1977), Ullman (1983), World Commission on Environment and Development (1987), and Mathews (1989).

11. See, for example, Connor (2004) and Physicians for Social Responsibility (2004).

12. For more discussion of the gaps in ES research, see Matthew, Brklacich, and McDonald (2004).

## References

- "Battle to get aid to Bangladesh." (2004, August 3). *CNN.com*. Retrieved October 1, 2004, from <http://www.cnn.com/2004/WORLD/asiapcf/08/03/bangladesh.floods.aid/index.html>
- Benini, Aldo A. & Lawrence H. Moulton. (2004). "Civilian victims in an asymmetrical conflict: Operation Enduring Freedom, Afghanistan." *Journal of Peace Research* 41(4), 403-422.
- Brown, Lester. (1977). *Redefining national security* (Worldwatch Paper 14). Washington, D.C.: Worldwatch Institute.
- Centers for Disease Control and Prevention. (2004, January 13). *Basic information about SARS*. Retrieved August 8, 2004 from <http://www.cdc.gov/ncidod/sars/factsheet.htm>
- Connor, Steve. (2004, January 9). "US climate policy bigger threat to world than terrorism." *Independent*. Retrieved October 13, 2004, from [http://news.independent.co.uk/low\\_res/story.jsp?story=479418&host=3&dir=70](http://news.independent.co.uk/low_res/story.jsp?story=479418&host=3&dir=70)
- Doyle, Michael. (1983). "Kant, liberal legacies, and foreign affairs." *Philosophy and Public Affairs* 12, 205-235, 323-353.
- Frontline. (2000, October). *Drug wars: Inside the \$400 billion global business*. Retrieved August 16, 2004, from <http://www.pbs.org/wgbh/pages/frontline/shows/drugs/business/>
- Gleditsch, Nils Petter & Indra de Soysa. (1999). "To cultivate peace: Agriculture in a world of conflict." *Environmental Change and Security Project Report* 5, 15-25.
- Hawley, T.M. (1992). *Against the fires of hell: The environmental disaster of the Gulf War*. New York: Harcourt Brace Jovanovich.
- Homer-Dixon, Thomas. (1999). *Environment, scarcity, and violence*. Princeton: Princeton University Press.
- Logan, Tracy. (2004, 27 July). "Why Bangladesh floods are so bad." *BBC News World Edition*. Retrieved October 1, 2004, from [http://news.bbc.co.uk/2/hi/south\\_asia/3929217.stm](http://news.bbc.co.uk/2/hi/south_asia/3929217.stm)
- Mathews, Jessica. (1989). "Redefining security." *Foreign Affairs* 68, 162-77.
- Matthew, Richard, Michael Brklacich, & Bryan McDonald. (2004). "Analyzing environment, conflict, and cooperation." In *Understanding environment, conflict, and cooperation* (pages 5-15). Nairobi, Kenya: United Nations Environment Programme.
- Matthew, Richard, Mark Halle, & Jason Switzer (Eds.). (2002). *Conserving the peace: Resources, livelihoods and security*. Geneva: IISD.
- Matthew, Richard & George Shambaugh. (1998). "Sex, drugs, and heavy metal: Transnational threats and national vulnerabilities." *Security Dialogue* 29,

- 163-175.
- “Most U.S. industry giants ignoring global warming.” (2003, July 9). *Environment News Service*. Retrieved October 13, 2004, from <http://www.commondreams.org/headlines03/0709-10.htm>
- Ophuls, W. (1976). *Ecology and the politics of scarcity*. San Francisco: Freeman.
- Physicians for Social Responsibility. (2004, February 24). *Pentagon on climate change: threat to national security “should be considered immediately”*; *New report outlines effects of climate change on national, global security* [Press release]. Retrieved October 13, 2004, from [http://www.psr.org/documents/psr\\_doc\\_0/program\\_3/Pentagon\\_Climate\\_Change\\_PR\\_02\\_24\\_2004.pdf](http://www.psr.org/documents/psr_doc_0/program_3/Pentagon_Climate_Change_PR_02_24_2004.pdf)
- Rosenau, James. (1990). *Turbulence in world politics: A theory of change and continuity*. Princeton, NJ: Princeton University Press.
- Schaffer, Clifford A. (n.d.) *Basic facts about the war on drugs*. Retrieved August 16, 2004, from <http://www.druglibrary.org/schaffer/library/basicfax.htm>
- Stossel, John. (2002, July 30). “Just say no: Government’s war on drugs fails.” Retrieved on August 16, 2004, from [http://abcnews.go.com/onair/2020/stossel\\_drugs\\_020730.html](http://abcnews.go.com/onair/2020/stossel_drugs_020730.html)
- South Asia Terrorism Portal. (n.d.) *Nepal terrorist groups: Communist Party of Nepal-Maoist*. Retrieved October 13, 2004, from <http://www.satp.org/satporgtp/countries/nepal/terroristoutfits/index.html>
- Ullman, Richard. (1983). “Redefining security.” *International Security* 8, 129-53.
- United Nations. (2004, August). *Growth in United Nations membership, 1945-2004*. Retrieved October 1, 2004, from <http://www.un.org/Overview/growth.htm#2000>
- U.S. Department of State. (2004, February 27). *Independent states in the world*. Retrieved October 1, 2004, from <http://www.state.gov/s/inr/rls/4250.htm>
- World Commission on Environment and Development. (1987). *Our common future* Oxford: Oxford University Press.
- World Trade Organization. (2004). “Members and observers.” In *Understanding the WTO: The organization*. Retrieved October 1, 2004, from [http://www.wto.org/english/thewto\\_e/whatis\\_e/tif\\_e/org6\\_e.htm](http://www.wto.org/english/thewto_e/whatis_e/tif_e/org6_e.htm)
- Zacher, Mark. (1992). “The decaying pillars of the Westphalian temple: Implications for international order and governance.” In James Rosenau and Ernst-Otto Cziempl (Eds.), *Governance without government: Order and change in world politics* (pages 58-101). Cambridge: Cambridge University Press.