

COMMENTARY: DEBATING ENVIRONMENT, POPULATION, AND CONFLICT



The environment, population, and conflict thesis remains central to current environment and security debates. During the 1990s, an explosion of scholarship and policy attention was devoted to unraveling the linkages among the three variables. While it can easily be argued that both the research and policy communities have made significant advances, the scholarly findings and policy lessons remain the subject of intense debate. The recent publication of a host of significant contributions to this debate dictated a special commentary section to supplement the lengthy book reviews provided in this 2000 issue of the Environmental Change and Security Project Report.

In the first article, leading figure Thomas Homer-Dixon and his colleagues from the University of Toronto respond to the prominent critique enunciated by fellow peace researcher Nils Petter Gleditsch from the International Peace Research Institute, Oslo (see box on Gleditsch's critique). Richard Matthew of the University of California, Irvine, comments on the five-year NATO Committee on the Challenges of Modern Society pilot study entitled Environmental Security in an International Context. Geoffrey D. Dabelko joins Richard Matthew to draw conclusions from a March 2000 environment, population, and conflict workshop with leading scholars. In the last commentary, University of California, Irvine researcher Ted Gaulin briefly critiques Indra de Soysa and Nils Petter Gleditsch's To Cultivate Peace: Agriculture in a World of Conflict, portions of which were reprinted in issue 4 of the ECSP Report.

The Environment and Violent Conflict: A Response to Gleditsch's Critique and Some Suggestions for Future Research

by Daniel M. Schwartz, Tom Deligiannis, and Thomas F. Homer-Dixon

INTRODUCTION

Nils Petter Gleditsch, senior researcher at the International Peace Research Institute, Oslo, has written a widely noted critique of recent research in the new field of environmental security (Gleditsch, 1998). Gleditsch's critique echoes and builds upon criticisms leveled by skeptics of environment-conflict research (e.g., Deudney, 1991; Levy, 1995; and Rønnfeldt, 1997). He identifies a number of specific "problems" of theory, conceptualization, and methodology, sometimes singling out the work of the team led by Thomas Homer-Dixon of the University of Toronto (henceforth referred to as the Toronto Group). In this article, we respond to these concerns and propose avenues for future research.

Methodological issues underpin Gleditsch's critique, and we therefore deal with them in detail. Gleditsch asserts that much environment-conflict research is methodologically unsound and fails to qualify as "systematic research." He contends it violates the rules of quasi-experimental methodology—used by conventional social scientists in lieu of true experimental methods that are not viable for many social scientific inquiries. This perspective is his starting point for identifying many of the specific problems in environment-conflict research. As a result, he disregards the detailed findings of the Toronto Group, the Swiss-based Environmental Conflicts project (ENCOP), and other research projects that do not meet his standards of evidence. We argue that Gleditsch's proposed approach is a methodological straightjacket that would, if widely adopted, severely constrain research in the field. We do not take issue with the quasi-experimental methodology per se. Rather, we show that the case-study method used by the Toronto Group has qualities that complement quasi-experimental methods.

In Section One, we address some of the conceptual and theoretical "problems" identified by Gleditsch and discuss his selective critique of the literature on the relationship between environmental scarcity and conflict. Gleditsch's critique does not address the validity of the specific findings that emerged from ENCOP and the Toronto Group. Instead, he treats these projects with a broad brush, at times associating them with other, less rigorous, research. Section two examines underlying methodological issues and addresses Gleditsch's concerns arising from his methodological perspective. The final section of the article looks forward and suggests avenues for future research on the environment-conflict nexus.

I. CONCEPTUAL AND THEORETICAL ISSUES

Gleditsch identifies a number of common "problems" with the literature on environmental stress and conflict. This section responds to conceptual and theoretical criticisms aimed explicitly at the Toronto Group's research.

BACKGROUND

Norwegian peace researcher Nils Petter Gleditsch makes a nine-point critique of environment, population, and conflict literature in his seminal 1998 article, "Armed Conflict and the Environment: A Critique of the Literature." These nine points, summarized below, spurred Thomas Homer-Dixon and his colleagues at the University of Toronto to pen the response published here. Gleditsch, senior researcher at the International Peace Research Institute, Oslo, (PRIO) maintains the literature has the following characteristics.

1. There is a lack of clarity over what is meant by "environmental conflict";
2. Researchers engage in definitional and polemical exercises rather than analysis;
3. Important variables are neglected, notably political and economic factors, which have a strong influence on conflict and mediate the influence of resources and environmental factors;
4. Some models become so large and complex that they are virtually untestable;
5. Cases are selected on values of the dependent variable;
6. The causality of the relationship is reversed;
7. Postulated events in the future are cited as empirical evidence;
8. Studies fail to distinguish between foreign and domestic conflict; and,
9. Confusion reigns about the appropriate level of analysis.

Nils Petter Gleditsch. "Armed Conflict and the Environment: A Critique of the Literature." *Journal of Peace Research* Vol. 35, no. 3, 1998: 381-400.

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This article—"The Environment and Violent Conflict: A Response to Gleditsch's Critique and Some Suggestions for Future Research" by Daniel M. Schwartz, Tom Deligiannis, and Thomas Homer-Dixon—is drawn from the forthcoming November 2000 edited volume by Paul F. Diehl and Nils Petter Gleditsch entitled *Environmental Conflict* (Westview Press). This volume promises to make a significant contribution to the environment, population, and conflict literature. Following, is the table of contents for *Environmental Conflict*:

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Employing a Comprehensive Definition of Scarcity

Disputes among scholars about how to conceptualize environmental stress have long hindered research on the links between this stress and violent conflict. Essentially, these are disputes about the delineation of the independent, or causal, variable. Gleditsch faults much of the literature for being "unclear as to whether the causal factor is absolute resource scarcity or environmental degradation." He criticizes Homer-Dixon's concept of *environmental scarcity*—which integrates supply, demand, and distributional sources of the scarcity of renewable resources—suggesting it "muddies the waters," although he fails to explain why (Gleditsch, 1998: 387).

Following Stephan Libiszewski, Gleditsch adopts a distinction between conflicts that result from "simple resource scarcity" and those that result from "environmental degradation" (Libiszewski, 1992). Unfortunately, however, Libiszewski's distinction is a wholly inadequate starting point for research on the environmental causes of violence. First, as Gleditsch himself acknowledges, the two categories are not causally separate: degradation of an environmental resource, like cropland or fresh water supplies, can cause a straightforward—or "simple" scarcity of that resource. Second, degradation of an environmental resource is only one of two possible sources of a decrease in a resource's supply. "Degradation" refers to a drop in the quality of the resource; but cropland, fresh water, and the like can also be "depleted," which means the resource's quantity is reduced. If we restrict our analysis to conflicts caused by degradation of environmental resources, we will omit a main source of the reduced supply of these resources in many poor countries around the world.

Third, environmental degradation, the phenomenon Gleditsch wants us to emphasize, is exclusively a supply-side problem: if we degrade a resource, then there is less of it available. Any hypothesis linking environmental degradation to violence is linking, essentially, the reduction in the resource's supply to violence. However, if we want to explore the causes of violence, a resource's *absolute* supply is not interesting. What we should investigate, rather, is the resource's supply *relative to*, first, demand on the resource, and, second, the social distribution of the resource. The relationships between supply and demand and between supply and distribution determine people's actual experience of scarcity, and under any practical hypothesis, it is these relationships that influence the probability of violence. This is the reason that we include demand and distributional aspects in our definition of environmental scarcity.¹

Fourth and finally, focusing on environmental deg-

radation alone tends to lead researchers to overlook or neglect key interactions—such as the processes we call *resource capture* and *ecological marginalization*—among supply, demand, and distributional pressures (Homer-Dixon, 1999: 73-80). *Resource capture* occurs when the degradation and depletion of a renewable resource (a decrease in supply) interacts with population growth (an increase in demand) to encourage powerful groups within a society to shift resource access (that is, to change the resource's distribution) in their favor. These groups

and misses crucial aspects of the environmental challenges facing the developing world. It is better, we believe, to acknowledge explicitly that the fundamental issue is one of scarcity of renewable resources and that any treatment of this scarcity should encompass the exhaustive set of scarcity's sources: decreases in supply, increases in demand, and changes in distribution. The Toronto Group incorporates these three facets of scarcity in its tripartite definition of scarcity.

“We argue that Gleditsch’s proposed approach is a methodological straightjacket that would, if widely adopted, severely constrain research in the field.”

tighten their grip on the increasingly scarce resource and use this control to boost their wealth and power. Resource capture intensifies scarcity for poorer and weaker groups in society. *Ecological marginalization* occurs when unequal resource access (skewed distribution) combines with population growth (an increase in demand) to cause long-term migrations of people to ecologically fragile regions such as steep upland slopes, areas at risk of desertification, tropical rain forests, and low-quality public lands within urban areas. High population densities in these regions, combined with a lack of knowledge and capital to protect the local ecosystem, cause severe resource degradation (a decrease in supply) (Homer-Dixon, 1999: 177). Resource capture and ecological marginalization are often intimately inter-linked, with one leading to the other.

Some might argue that by including distributional issues in our definition of environmental scarcity, the Toronto Group makes the concept so broad as to be useless, because the group classes conflicts solely over resource distribution as environmental conflicts.² The argument is misguided. Uneven distribution never acts on its own: its impact is always a function of its interaction with resource supply and demand. In practical terms, the reason resource distribution is important is that the resources people want (that are, in other words, in demand) are in finite supply. Indeed, the Toronto Group found in its research that problems of declining resource supply and rising resource demand were always intimately entangled with uneven resource distribution.

For these four reasons, an exclusive focus on environmental degradation in environment-conflict research unreasonably restricts, distorts the scope of the research,

Challenging Simonesque Optimism

At a more fundamental level, Gleditsch questions the very idea that humanity is facing increasing environmental scarcities. His critique seems to be guided by the assumption that the links between environmental scarcity and violence are overstated, because humanity shows astonishing capacity to adapt to scarcities (Gleditsch, 1998: 383-384 and 395). Markets stimulate human inventiveness and commerce that open up new sources of scarce resources, encourage conservation, and create technologies that allow substitution of relatively abundant resources for scarce ones. These adaptive processes certainly operate in many cases, as we have previously noted (Homer-Dixon, 1995; Homer-Dixon, 1999: 31-5 and 107-32). But Gleditsch does not acknowledge that societies often fail to adequately adjust to scarcity, with poverty, migrations, and institutional failure the result. Environmental scarcities unquestionably have profoundly debilitating effects on some economies, societies, and social groups.³ Just because humans are remarkably adaptive in some cases does not mean that they are always adaptive.

Gleditsch seems particularly influenced by Julian Simon's cornucopian thesis that, based on the historical record, human societies can bring to bear on their resource scarcities sufficient ingenuity to prevent any decline in well-being over the long run (Simon, 1996). But Simon's techno-optimist arguments are too simplistic, for three reasons. First, he tends to project the truly extraordinary improvements in human well-being over the past two centuries linearly into the future, without much questioning or reflection. Yet, if we look back further than two hundred years, it is clear that human affairs

have my been marked by many 'non-linear' events—sudden, sharp changes in economic and social behavior—some of which have had decidedly negative effects on human well-being. The progress of the last two centuries is not the only evidence we should use to estimate our trajectory into the future.

Second, when Simon analyzes trends in human well-being, he usually uses highly aggregated data, such as statistical averages for all of humankind. Yet, when these data are disaggregated—that is, broken into sub-categories—Simon's optimism is less persuasive. For example, although both the percentage and absolute number of hungry people have fallen globally in the last twenty years, Latin America, South Asia, and especially sub-Saharan Africa have not seen reductions in the absolute number of hungry people.⁴ Third and finally, close study of specific cases shows that societies do not always generate the ingenuity they need when and where it is needed (Lele and Stone, 1989). Although environmental and demographic stress often drives up the requirement for ingenuity in poor countries, a number of factors—including market failure, inadequate human capital, and political competition over scarce natural resources among powerful groups—can impede the flow of ingenuity (Homer-Dixon, 1999: 107-32).

Homer-Dixon and others have responded with considerable theoretical and empirical detail to the arguments of Simon and other techno-economic optimists (Homer-Dixon, 1999: 28-44; Cohen, 1995; Ahlburg, 1998). Nowhere does Gleditsch acknowledge these responses. The determinants of adaptation to scarcity are a major outstanding issue for researchers in this field. Gleditsch would better advance our understanding if he engaged with the various positions on the issue, rather than appearing to accept the arguments of the optimists at face value.

Bringing Nature into Social Theory

Gleditsch's skepticism about the seriousness of environmental scarcities is the starting point for a key element of his critique of the environment-conflict literature. He argues that the literature overstates the impact of environmental scarcities on violent conflict and, in the process, ignores other, perhaps more powerful causal variables. "Far too many analyses of conflict and the environment are based on... overly simplistic reasoning,"

he writes. "The greatest weakness in this respect is that much of this literature ignores political, economic, and cultural variables" (Gleditsch, 1998: 389). By deemphasizing environmental scarcities, Gleditsch correspondingly emphasizes other variables.

This approach implies that environmental stress may be no more than an intermediate or intervening variable between dysfunctional political and economic institutions and conflict. Thus, Gleditsch asks if

“Environmental scarcities unquestionably have profoundly debilitating effects on some economies, societies, and social groups.”

environmental conflict “may be primarily an underdevelopment problem,” because environmental degradation or “load” is strongly correlated with poverty (Gleditsch, 1998: 396). He seems to argue that conflict in developing countries is best explained by social causes, not by the physical influences of the natural environment. In the process, like many scholars of comparative development, Gleditsch marginalizes the physical circumstances of hu-

man society as explanatory variables; he appears to consider them to be, at most, secondary causes of social behavior. When it comes to violent conflict, they are merely aggravators of already existing social stresses. If this is his position, Gleditsch is making a classic endogeneity mistake: he is claiming that environmental problems are a consequence of, and endogenous to, the broader social system and that, therefore, any conflict caused by environmental problems is ultimately caused by social factors.

It is unquestionably true that social variables must be central to any adequate explanation of human conflict, whether in rich or poor countries. The Toronto Group discusses at length the political, economic, and cultural factors that interact with environmental scarcity to cause violence. The societies most vulnerable to environmentally-induced violence are those simultaneously experiencing severe environmental scarcity and various forms of institutional failure (especially failures of states and markets) that hinder social adaptation to the scarcity. The key role of social variables must therefore be acknowledged. However, this requirement does not mean that physical variables should be made fully endogenous to the social system and, consequently, turned into relatively uninteresting secondary causes of social conflict and stress.⁵

As Homer-Dixon has noted, there are three reasons why environmental scarcity should be considered at least

partly an exogenous factor in social behavior and conflict and why, therefore, environmental scarcity deserves research attention in its own right (Homer-Dixon, 1999: 16-18 and 104-6). First, environmental scarcity is not only influenced by social variables like institutions and policies; it can itself affect these institutions and policies in harmful ways. This is the case when shortages of a renewable resource, such as cropland or forests, motivate elites to seize control, through either legal or coercive means, of the resource's remaining stocks (*resource capture*). In other words, we should not assume that social variables are completely independent and external starting points in the causal chain; it turns out that they can be affected by environmental scarcity, sometimes negatively. Second, the degree of environmental scarcity a society experiences is not, as it turns out, wholly a result of economic, political, and social variables, like failed institutions and policies; it is also partly a function of the particular physical characteristics of the society's surrounding environment. These characteristics are, in some respects, independent of human activities. For example, the vulnerability of coastal aquifers to salt intrusion from the sea and the depth of upland soils in tropical regions are physical "givens" of these environmental resources. Third, once environmental scarcity becomes irreversible—as when most of a country's vital topsoil washes into the sea—then the scarcity is, almost by definition, an external influence on society. Even if enlightened reform of institutions and policies removes the underlying social causes of the scarcity, because the scarcity itself is irreversible, it will remain a continuing burden on society.

The claim that environmental scarcity can be, in part, an exogenous variable, should not be confused with the claim (which we do not make) that environmental scarcity can have a direct impact on conflict. We argue that the link between environmental scarcity and conflict is most often indirect. Nevertheless, environmental scarcity can still have an exogenous impact on the social conditions that eventually lead to conflict.

Identifying Key Variables

Gleditsch claims that the Toronto Group and other researchers overlook important variables like regime type and democracy. However, the Group's full model does integrate regime-type variables into its analysis of the social and economic effects of environmental scarcities. In the scholarly literature on the origins of revolutions and civil violence, the variables of *opportunity structure* and *state capacity*, which are central to the Toronto Group's model, are recognized as integral aspects of regime type (Goodwin, 1997; Tarrow, 1994; Skocpol,

1979). Furthermore, in his recent work, Colin Kahl explicitly builds on the Toronto Group's model to further our understanding of how regime type affects the links between environmental scarcity and violence (Kahl, 1998).

More specifically, however, Gleditsch's suggestion that the Toronto Group is blind to the importance of regime type is, on close reading, actually a call for the inclusion of a *democracy* variable in environment-conflict models (Gleditsch, 1998: 389).⁶ We agree with Gleditsch that a more explicit focus on democracy could be beneficial—as long as analysts are careful in their use of "democracy." As Homer-Dixon has argued, "the term *democracy* is used too loosely by lay commentators and experts alike. It commonly encompasses an extraordinarily variegated set of social phenomena and institutions that have complicated and multiple effects on the incidence of social turmoil and violence" (Homer-Dixon, 1999: 182).⁷ Gleditsch deserves credit for advancing environmental conflict literature along this important theoretical path. If future research can address the difficult issues surrounding the precise definition and operationalization of democracy, important findings may yet emerge.⁸

Using Historical Evidence

Finally, Gleditsch claims that the Toronto Group's theory about the links between environmental scarcity and conflict is flawed, in part because it is founded on inferences about future scarcities. Gleditsch asserts that "Homer-Dixon, and many other authors. . . have stressed the potential for violent conflict in the future" without providing adequate empirical evidence of past or present linkages between environmental scarcities and violent conflict (Gleditsch, 1998: 393).⁹

Gleditsch is mistaken that the Toronto Group uses "the future as evidence" to substantiate its claims that there are links between environmental scarcities and conflict. In the process of developing its model, the Group has undertaken more than a dozen detailed historical case studies. These include studies of the Chiapas rebellion, the Rwandan genocide, violence between Senegal and Mauritania, civil conflict in the Philippines, and ethnic violence in Assam, India.¹⁰ The historical analyses in these case studies were informed by the rich literatures on the causes of revolution, insurgency, and ethnic strife. Taken together, they are a foundation for the Toronto Group's larger theoretical model about linkages between environmental scarcity and violent conflict. None of the hypotheses in this model depends on events yet to come; rather, the model is informed by events that have already taken place.¹¹

To support his claim that the Toronto Group uses the future as evidence for its model, Gleditsch takes issue with commentators who argue that water scarcity in the Middle East could lead to armed conflict in the future. Without referring to any research in particular, but having identified the Toronto Group by name at the beginning of the paragraph, Gleditsch concludes that this is a hypothesis “based on controversial theory and debatable extrapolations, rather than ‘data’ which may confirm the prediction” (Gleditsch, 1998: 394). Gleditsch thus conflates the findings of the Toronto Group with largely unsubstantiated claims by other writers regarding the potential for conflict over water resources.

The specific findings of both the Toronto Group and ENCOP are certainly worthy of detailed consideration in any discussion of links between environmental scarcity and conflict. In this case, Gleditsch did not refer to the Toronto Group’s thinking on the consequences of water scarcity. Had he done so, he would have noted a number of interesting hypotheses worthy of testing. Homer-Dixon argues that the world is not about to witness a surge of water wars. “Wars over river water between upstream and downstream neighbors are likely only in a narrow set of circumstances,” Homer-Dixon writes. “The downstream country must be threatening to restrict substantially the river’s flow; there must be a history of antagonism between the two countries; and, most importantly, the downstream country must believe it is militarily stronger than the upstream country. . . . There are, in fact, very few basins around the world where all these conditions hold now or might hold in the future” (Homer-Dixon, 1999: 139). The Toronto Group’s research on water scarcity is, in fact, at odds with sensationalist claims about water wars.

II. FINDING OUR WAY IN THE WILDERNESS

Underpinning many of Gleditsch’s criticisms are deeper methodological issues pertaining to the conduct of social science inquiry. Gleditsch claims, for instance, that the Toronto Group fails to select cases appropriately, neglects to investigate the possibility of reverse causation, devises untestable models, overemphasizes the complexity of ecological-political systems, and lacks the tools to weight causal variables. These criticisms can only be understood in the context of Gleditsch’s unduly narrow perspective on what constitutes “systematic research.”

In this section, we first show that process-tracing within single cases should be an integral part of system-

atic research in the social sciences; this method complements more conventional quasi-experimental approaches. Drawing a distinction between *causal effects* and *causal mechanisms*, we then show why Gleditsch’s criticisms of the Toronto Group’s research—as identified in the previous paragraph—are unfounded. We also recap some of the key findings of the Toronto Group that Gleditsch overlooked as a result of his methodological bias. In short, we show that there are more than a “few lights in the wilderness” to guide future research into the relationship between environment and conflict.

Conducting Systematic Research

Gleditsch asserts that scholars have conducted little systematic research to date on the link between environmental scarcity and violent conflict (Gleditsch, 1998: 384-7). By “systematic” research, he seems to mean either experimental or quasi-experimental analyses. (He discusses statistical analyses and controlled-case comparisons in particular, but quasi-experimental methods can include counterfactual analyses and congruence procedures.) Gleditsch additionally contends that past research into the links between environment and conflict consisted merely of “exploratory case-studies” that failed to demonstrate causal connections (Gleditsch, 1998: 392).

In our opinion, Gleditsch has an overly circumscribed view of what counts as systematic research in the social sciences. Many social science methodologists have long recognized that systematic research includes not only experimental and quasi-experimental methods, but single-case methods as well.¹² Highly influential studies in the social sciences—such as Graham Allison’s *Essence of Decision* (1971) and Arend Lijphart’s *The Politics of Accommodation* (1975)—have used single case studies to build and test theories.¹³

At issue in this debate over the merits of the case-study method are fundamental ontological and epistemological questions pertaining to the nature of causation. Among competing views on how causation can be demonstrated, philosopher David Hume’s arguments remain influential.¹⁴ Hume asserted that causation could be demonstrated only by showing a high degree of covariance between types of events, which he termed *constant conjunction*. Hume’s notion of constant conjunction underpins experimental and quasi-experimental methodologies in the social sciences; many researchers, including Gleditsch, appear to believe that it also vitiates the single-case method.

However, Andrew Bennett (1997) shows convincingly that Hume’s notion of causality underpins not only experimental and quasi-experimental methods but the

single case-study method as well. Bennett notes that Hume recognized three “sources of causality,” only one of which was constant conjunction. The other two were *temporal succession* and *contiguity*. Bennett argues that while constant conjunction is related to what methodologists term *causal effect*, temporal succession and contiguity are related to *causal mechanism*. The causal effect of an explanatory variable is defined by Bennett as “the change in probability and/or value of the depen-

understand why Allison’s *Essence of a Decision* and Lijphart’s *The Politics of Accommodation* had such momentous impact on the field of political science. Both seriously challenged long-standing theories: Allison’s analysis of decision-making during the Cuban missile crisis undermined the notion of the state as a unitary, rational actor; and Lijphart’s analysis of politics in the Netherlands challenged prevailing ideas about the impact of political cleavages. The important processes these

“ [A]n exclusive focus on environmental degradation in environment-conflict research unreasonably restricts, distorts the scope of the research, and misses crucial aspects of the environmental challenges facing the developing world.”

dent variable that would have occurred if the explanatory variable had assumed a different value.” Causal mechanism, on the other hand, is defined as “the causal process and intervening variables through which causal or explanatory variables produce causal effects” (Bennett, 1997: 18-19). Both causal effect *and* causal mechanism are therefore essential and complementary facets of causality. While the experimental and quasi-experimental methods aim to gauge causal effect, they say little about causal mechanism. The single-case method, conversely, helps reveal causal mechanism but gives little indication of causal effect. In short, neither the experimental and quasi-experimental nor the single-case method is sufficient to demonstrate causation with any finality. It is equally evident, however, that the single-case method is a necessary tool to demonstrate causation.

An example from the natural sciences illustrates the distinction between causal effect and causal mechanism. Although the correlation between smoking and cancer has been known for many years, only within the last five years have researchers pinpointed exactly *how* smoking engenders cancer. That is, the causal effects were already known, but until recently the causal mechanisms remained unknown. The recent identification of these mechanisms has put the tobacco industry on the defensive, because they now find it harder to retreat to the claim that scientific proof is lacking.¹⁵

The distinction between causal mechanism and causal effect is also cogent for the social sciences. Timothy McKeown notes that only by distinguishing between causal effect and causal mechanism can one begin to

authors identified in their case studies would have been overlooked in a statistical analysis. McKeown (1999: 172-174) asserts these case analyses had a large impact precisely because they highlighted *how* events unfolded by identifying their causal mechanisms.¹⁶

Several leading philosophers of science have made similar points. Wesley Salmon (1984: 121), for example, argues in favor of explicating causal mechanisms: “The mere fitting of regularities into patterns has little, if any, explanatory force.” Andrew Sayer (1992: 106-7) states that “what we would like... is a knowledge of *how* the process works. Merely knowing that *C* has generally been followed by *E* is not enough: we want to understand the continuous process by which *C* produced *E*.” And Abraham Kaplan (1964: 329) asserts that “we see better *why* something happens when we see better—in more detail, or in broader perspective—just *what* does happen.”¹⁷

Bennett notes that the distinction between causal effect and causal mechanism has prompted a debate among methodologists about which of these two sources of causality is more important. Although some analysts suggest that causal effects are “logically prior to the identification of causal mechanisms” (King, Keohane, and Verba, 1994: 86), others insist that causal mechanisms are “ontologically prior” to causal effect (Yee, 1996: 84). Bennett dismisses this controversy, arguing that “causality involves both causal effects and causal mechanisms and its study requires a diversity of methods, some of which are better adapted to the former and some to the latter” (Bennett, 1997: 25).

Bennett's reluctance to confer priority on either causal effect or causal mechanism, however, does not suggest that the identification of one should not precede the identification of the other in terms of the practical task of puzzle solving in the social sciences. Indeed, when a research program is in its early stages and the underlying theory is still largely undeveloped,

social science, it is impossible to control all variables that may affect the dependent variable under study; therefore, researchers must pick and choose their control variables carefully. Process-tracing helps identify those particularly worthy of control.²¹ Also, process-tracing reveals variables and causal patterns that may not emerge from statistical analysis. For instance, the

“The societies most vulnerable to environmentally-induced violence are those simultaneously experiencing severe environmental scarcity and various forms of institutional failure... that hinder social adaptation to the scarcity.”

focusing first on causal mechanisms is probably the best strategy. Once researchers have discovered these causal mechanisms and elaborated the theory, they can then begin to estimate causal effects.¹⁸ Thus George and McKeown emphasize the role that single-case methods (involving process-tracing) can play in the development of theory (George and McKeown, 1985: 34-41).¹⁹

With this methodological underpinning, the Toronto Group set out to perform a series of case studies of the causal links between environment scarcity and conflict. Although the possibility of such links had been recognized by previous scholarship, theory was rudimentary. Using a process-tracing approach, the Toronto Group conducted over a dozen case studies to better understand the causal mechanisms that might connect environmental scarcity to conflict. The results produced by the Toronto Group reflect the methodology used: the Group does make general claims about causal mechanisms (for example, at the end of his second *International Security* article on the subject, Homer-Dixon says explicitly that “environmental scarcity causes violent conflict”), but it has been careful to avoid making such claims about causal effects (nowhere in the Group's research reports are there any claims about the power of environmental scarcity relative to other potential causes of conflict).²⁰

Without undertaking research into causal mechanisms, estimates of causal effect are far less illuminating, for two reasons. First, researchers will not know which potentially confounding variables they should control in their statistical tests; and, second, researchers may overlook key processes and causal relationships that are hidden in the data. In quasi-experimental methods of

patterns of ecological marginalization and resource capture, which were discovered by the Toronto Group using process-tracing, are not obvious and would undoubtedly have remained hidden from statistical analysis. The Group's research suggests, however, that quasi-experimental and statistical methods should now be used to investigate these patterns.²² This more inclusive understanding of systematic research helps us address five further concerns raised by Gleditsch about contemporary environment-conflict research: selection of cases on the independent and dependent variables; failure to consider that the dependent variable may in fact be an important cause of the independent variable; a propensity to develop untestable models; overemphasis on the complexity of ecological-political systems; and an inability to gauge the relative power of environmental scarcity as a cause of conflict.

Selecting Case Studies

Following Marc Levy (1995) and Carsten Rønnfeldt (1997), Gleditsch contends that choosing cases in which both environmental scarcity and violent conflict were known *a priori* to exist, violates a fundamental principle of research design that applies to both qualitative and quantitative analyses. Consequently, Gleditsch (1998:391-92) asserts this practice produces nothing more than “anecdotal evidence” to support its hypotheses.

Gleditsch's approach to research design appears to hinge on the assumption that causality is little more than causal effect. Causal mechanism is regarded as less important or is simply not considered at all. Although we agree that researchers must allow for variation on both

the independent and dependent variable if they want to estimate causal effect, we contend researchers will find such an approach less helpful in identifying causal mechanisms. If causal mechanism is believed to be an integral aspect of causality, then selecting case studies on the independent and dependent variable is hardly an egregious error in research design. Indeed, in order to understand whether there are causal links between environmental scarcity and violent conflict—and, if there are, *how* these variegated links work—it will be sometimes necessary to select cases in this manner. The Toronto Group therefore intentionally selected cases in which environmental scarcities and violent conflict were known *a priori* to exist (Homer-Dixon, 1999: 169-76). The Group then used *process-tracing* to determine if the independent and dependent variables were actually causally linked, and, if they were, to induce from a close study of many such cases the common mechanisms of causality and the key intermediate variables that characterized these links.

A related objection to selecting cases on both the independent and dependent variables is that the researcher might as a result, overlook possible confounding variables and spurious relationships. The researcher might, for instance, believe that data show a causal link between variables *A* and *B*, a link that fits the researcher's hypothesis nicely. But the researcher might fail to look for variable *C*, a variable that is linked to both *A* and *B* and is a cause of both. For example, environmental scarcity might appear to be a cause of conflict, but, in reality, not be a cause, if poverty is actually a cause of changes in both these variables. This concern, however, is misplaced, because vigilant case-study researchers should detect such situations. Eckstein (1975: 125-26) contends that such researchers can test "countertheories"—that is, theories about other likely causes of changes in the value of the dependent variable.²³ Just as the quasi-experimental researcher must anticipate variables to control, the case-study researcher must anticipate potentially spurious causal mechanisms.

Investigating Reverse Causation

A distinction between causal effect and causal mechanism helps us address Gleditsch's concern that violent conflict (the dependent variable in most research) may in fact be an important cause of environmental scarcity (the independent variable). Gleditsch (1998: 393-3) claims that environment-conflict researchers have neglected this possibility of reverse causation and have likewise failed to consider the possibility that environmental scarcity and violent conflict are related to each other in a positive feedback loop—that is, a vicious circle.

We do not deny that conflict may exacerbate environmental scarcity, but this possibility was not the focus of the Toronto Group's research. Nevertheless, we would argue that process-tracing offers an excellent way to discover reverse causality, because it unearths causal mechanisms. It allows researchers to trace causal mechanisms that unfold over long periods of time and thereby to investigate the impacts of past conflicts on subsequent environmental conditions. An approach that focuses on causal effects, however, cannot reveal reverse causation as easily. Although simultaneous equations can be used to model reverse causation, and although quasi-experimental methods, using lagged variables or congruence procedures, can be used to span time, a far more intuitive approach is to focus on causal mechanisms, because they will tell the researcher exactly *how* past conflicts exacerbated environmental scarcity.

Moreover, the quasi-experimental method can produce ambiguous results when attempting to differentiate between cause and effect. Consider the following example: When a barometer falls, deteriorating weather is likely to follow. Although it precedes the change in weather, the falling barometer clearly does not cause this change. Thus, we can not distinguish between cause and effect. If we understand the mechanism that causes the barometer to fall, however, we understand that cause and effect can only be differentiated once weather conditions *prior* to the barometer's fall are controlled (Miller, 1987: 34).

Constructing Testable Models

While Gleditsch contends that much of the environment-conflict literature to date is overly simplistic, he asserts that the Toronto Group is guilty of just the opposite mistake—that is, of developing overly complex models that are not testable (1998: 391-92). We believe that Gleditsch contradicts himself here by demanding a strict adherence to conventional research design while simultaneously agitating for an incremental and modular approach to theory building. Conventional research design forbids the omission of variables that are correlated with the key independent variable. Such an omission creates what Gary King, Robert Keohane, and Sidney Verba (1994: 168-176) term an *omitted variable bias*. Many of the variables considered by the Toronto Group are correlated with the key independent variable of environmental scarcity. If Gleditsch is suggesting that we drop these variables out of the equation in the name of testable models, he is also suggesting that we contravene a fundamental canon of conventional research design.

Since the Toronto Group did not adopt such a re-

search design, however, this internal contradiction does not directly concern us. Nevertheless, Gleditsch's agitation for less complexity is disturbing. If environmental scarcity were either a necessary or a sufficient cause of conflict, it would be possible to reduce our model's complexity. Of course, environmental scarcity is neither a necessary nor sufficient cause (there are few, if any, such

cal, and physical systems are just as complex or even more complex (although some unquestionably are not).

The problem of complexity exists in the real world. It cannot be wished away by assuming that it resides only in the mind of the researcher. Gleditsch's extraordinarily strong constructivist position on this issue is questionable both empirically and philosophically

“ [T]he Toronto Group and ENCOP, among others, is not only theoretically and conceptually intact, but also rests on sound methodological pillars.”

causes of conflict). If, therefore, researchers are to make a nomothetic claim about the relationship between environmental scarcity and conflict, environmental scarcity must be part of what philosopher J. L. Mackie (1965) terms an *INUS* condition: it must be an *insufficient* but *necessary* component of a condition that is itself an *unnecessary* but *sufficient* cause of conflict.

Discovering INUS conditions is the goal of the case-study researcher. For environmental-conflict researchers, this entails unearthing the myriad and variegated ways in which environmental scarcity interacts with other social, economic, and political factors to engender conflict. We do not mean to suggest that a process-tracing approach eclipses the important goal of parsimony. Rather, by focusing on relevant causal mechanisms, process-tracing helps the environment-conflict researcher determine the boundaries of the INUS condition. Without a clear picture of these boundaries, simply dropping variables in the name of parsimony becomes a haphazard affair. Once these boundaries have been defined, however, estimating causal effects becomes a more precise procedure.

Dealing with Complex Systems

According to Gleditsch, the Toronto Group claims that ecological-political systems are more complex than strictly social or physical systems. He goes on to argue that this claim is unwarranted because “any social system is as complex as the theory developed to study it” (1998: 392). In other words, the complexity is in the mind of the beholder, rather than in the phenomenon itself. Actually, the Toronto Group does not argue that ecological-political systems are more complex. They argue simply that these systems are, intrinsically, exceedingly complex. No doubt many social, biologi-

(Rescher, 1998). Researchers in a variety of fields increasingly acknowledge the reality of complexity and are developing powerful theories to understand complex systems. These theories raise serious questions about conventional (often mechanistic) explanations of social phenomena and about the conventional methodologies used to study these phenomena (Cowan, Pines, and Meltzer, 1994). Rather than denying complexity's existence, Gleditsch and other social scientists should explicitly acknowledge the problems it creates for their research and try to develop methods—such as those focusing on causal mechanisms—for dealing with it.

Weighting Causal Variables

Gleditsch implies that process-tracing within single case-studies does not allow researchers to gauge the relative weights of causal variables (1998: 384-386). He also suggests that the quantitative analysis by Wenche Hauge and Tanja Ellingsen (1998) is one of the few attempts to test systematically the relationship between environmental scarcity and conflict. These researchers, he notes, did find a statistically significant relationship between environmental degradation and violent conflict, but they concluded that economic and political variables were more important than environmental variables. Thus, Gleditsch implicitly accepts the notion that independent variables can be assigned weights that indicate their relative causal power. Gleditsch, of course, is hardly alone here. Causal weighting is widely considered to be the ultimate goal of statistical analyses, and the lack of ability to weight variables using single case studies is considered this method's foremost drawback.

The practice of causal weighting, however, has its problems. Elliott Sober (1988) contends that the standard statistical technique of analysis of variance

(ANOVA) does not actually yield causal weights. Rather, it identifies the *difference* that various causes can make in an observed effect. Ascertaining the difference, Sober maintains, is distinct from ascertaining a causal weight. Similarly, Richard Lewontin (1976) argues that, although causal weighting may be appropriate when the relationships among variables are additive, it is misguided when the relationships are interactive. Lewontin contends that analysis of variance produces uninterpretable results when dealing with interactive variables.

If environmental scarcity is one component of an INUS condition, as argued above, then environment-conflict researchers are not dealing with additive relations among causal variables. Rather, these relationships are interactive. Environmental scarcity, for example, interacts with a society's ability to supply social and technical ingenuity. If the society can supply abundant ingenuity in response to its environmental problems, then severe social disruptions will probably be avoided; if it cannot, then negative outcomes, including conflict, are much more likely.

Interactivity is hardly limited to the relationships among variables in ecological-political systems. Most social systems exhibit interactivity among variables. That so many researchers treat the relationships among variables in social systems as additive does not reflect the reality of these systems. Rather, it reflects misguided attempts by researchers to avoid dealing with the reality of the *complexity* of these systems.

III. SUGGESTIONS FOR FUTURE RESEARCH

In Gleditsch's final section, entitled "The Way Ahead," he asserts that "critique will serve to advance the field only if it stimulates more satisfactory research" (Gleditsch, 1998: 395). Although we do not agree that all work on environment and conflict has been unsatisfactory, we do agree that debates in the field, such as the one we are engaged in here, can provide the spark for new research agendas. In this spirit, we draw on the above remarks to make some suggestions for future work. These suggestions fall in five categories: filling data gaps, operationalizing key variables, specifying contextual factors, dealing with complexity, and encouraging methodological pluralism.

Filling Data Gaps

We agree with Gleditsch that serious data gaps impede research on the links between environment and conflict. There is a particular lack of good data on the

extent and degree of soil, water, and forest degradation in developing countries; data on resource distribution and resource-use practices are also poor. The field therefore needs a more systematic and rigorous approach to data collection. Because this research crosses so many disciplinary boundaries, systematic data collection must involve intimate collaboration with experts in a wide range of disciplines, including soil science, hydrology, forest ecology, and the political economy of community resource use.

In our efforts to improve the foundation of data on which we build our environment-conflict research, however, we must recognize that not all good data are *quantitative*: process-tracing of single cases, in fact, generates thick descriptions of environment-conflict linkages—descriptions rich with *qualitative* data. More local case studies are needed, which build upon research done to date, and test and refine existing hypotheses at the local level.

Operationalizing Key Variables

If environment-conflict researchers want to estimate causal effect, it is essential that they include in their analyses key variables identified by environment-conflict research. In order to include these variables, efforts must turn towards their operationalization.

The Toronto Group has identified a number of variables that play a pivotal role in the link between environment and conflict. For instance, as noted above, the quantity of ingenuity a society supplies in response to environmental scarcity can play a key role in determining its ability to adapt to that scarcity. The supply of ingenuity, then, is an independent variable that should be included in any statistical analysis attempting to measure the causal effect of environmental scarcity on conflict (Homer-Dixon, 1999: 107-114).

But, operationalizing this variable is not a straightforward task. Researchers need an adequate measure of ingenuity. The Toronto Group has identified other measures that should be included in any complete statistical analysis—and that therefore require operationalization—including state capacity and social segmentation, as well as the aforementioned processes of resource capture and ecological marginalization (which can potentially be represented as single variables).²⁴

Specifying Contextual Factors

Empirical research has now identified some causal mechanisms linking environmental scarcity and violence. However, much more work remains to be done to determine precisely the intervening and interacting

variables—the contextual factors—affecting the strength of these processes. Under what circumstances, exactly, do these processes unfold? In the following, we refer to some of the specific findings of the Toronto Group, and suggest some contextual factors worthy of further investigation.

- By setting in motion processes of resource capture and ecological marginalization, environmental scarcity often increases the wealth gap between those elites that take advantage of the opportunities scarcity offers and those marginal groups that suffer the brunt of scarcity. How does the degree of state autonomy affect these two processes? To what extent would better-defined and enforced property rights reduce the predatory behavior of elites?
- The multiple effects of environmental scarcity increase demands on the state, stimulate intra-elite behavior, and depress state tax revenues. Such pressures can weaken the administrative capacity and legitimacy of the state. How does institutional design affect state capacity in the presence of these pressures? How do international economic forces both aggravate and mitigate these pressures?
- Narrow distributional coalitions (e.g., coalitions of rent-seekers that work to redistribute the economy's wealth in their favor) often block institutional reform—including reform of markets, property rights, judicial systems, and the state's resource-management regimes—essential to reducing environmental scarcity or alleviating its harsh effects. To what extent does scarcity provoke such behavior? Can a robust civil society counteract the obstructionist behavior of these narrow distributional coalitions?

Dealing with Complexity

At the methodological level, we need to explore how causation works at the interface between the physical/ecological and social worlds. Environment-conflict research brings us face to face with some of the most intractable issues in philosophy of science, specifically whether causal generalizations describing the social world have the same status as those describing the natural world. Because systems in both these domains are fundamentally complex—characterized by huge numbers of components, causal interactions, feedback loops, and nonlinearity—environment-conflict researchers can gain insights from complexity theory. We urge greater receptivity to the concepts and findings of this rapidly developing field.

Encouraging Methodological Pluralism

In order to deal with the research challenges described above, we encourage our colleagues to accept a degree of methodological pluralism. The various methods available to us make up a diverse set of arrows in the quiver of the social scientist, and we should choose the arrow most likely to hit our target. Statistical and quasi-experimental methodologies are needed to identify correlations and causal effects; process-tracing of single cases is needed to specify causal mechanisms. These two general approaches should not be used in isolation from each other; rather, we should try to exploit the synergies that are possible when they are used in parallel by collaborating researchers. For instance, statistical analysis can identify outliers and anomalous cases that deserve focused attention using process-tracing; in turn, process-tracing can identify key interacting variables and scope conditions that should be incorporated into statistical tests of the environment-conflict hypothesis.

Methodological pluralism, however, is not a license for shoddiness. Researchers should be held to high standards of evidence. This paper has demonstrated that the environment-conflict research of the Toronto Group and ENCOF, among others, is not only theoretically and conceptually intact, but also rests on sound methodological pillars. We hope that future researchers will use this body of evidence to deepen our understandings of the linkages between environmental scarcity and violent conflict.

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NOTES

¹ The three main sources of environmental scarcity include reduced supply, increased demand, and skewed distribution. See Homer-Dixon (1999: 47-72).

² An anonymous reviewer of this article raised this objection, as well as David Dessler (1999: 100-101).

³ The literature supporting this claim is so vast it cannot be summarized. An excellent survey can be found in, World Bank (1992). See also Midlarsky (1999) who provides compelling empirical evidence on the intimate connections between scarcity (including resource scarcity), inequality, and social conflict. Dasgupta (1993) provides an economic analysis of the effect of resource scarcity on communities in the developing world. Good and relatively current surveys of the state of the environment in China and India, which together constitute about forty percent of the world's population, are Smil (1993) and Repetto (1994).

⁴ Recent data from the Food and Agriculture Organization (FAO, 1999a) shows that the percentage of undernourished people in all three regions has either remained steady (sub-Saharan Africa) or fallen (South Asia and Latin America). However, the absolute number of undernourished people over the past thirty years has either grown (sub-Saharan Africa and South Asia), or remained relatively stable overall (Latin America). See also FAO, 1999b.

⁵ Dan Deudney (1999), has recently coined the phrase *social-social theory* for theories that presume social events have only social causes; he uses *nature-social theory* for theories in

which natural variables play a significant causal role.

⁶ Gleditsch writes that 'words such as "democracy" or "autocracy" do not occur in the model. In view of the extensive theoretical literature "relating the degree of democracy to civil violence . . . a democracy variable should have been included explicitly."

⁷ For an excellent treatment of the variegated nature of democracy, see Collier and Levitsky (1997).

⁸ The differentiation of the "democracy variable," in the State Failure Task Force's Phase II report, represents an attempt to move in this direction. See Esty, et al (1999: 52-53).

⁹ "Much of the literature," Gleditsch writes, "deals with conflicts of interest involving *potential* violence rather than with *actual* violence. . . . The argument is entirely in terms of *future* wars, which may happen." (Italics in original.)

¹⁰ Several of the Toronto Group's historical case studies are reproduced in Homer-Dixon and Blitt (1998).

¹¹ ENCOP similarly relied upon a large number of historical case studies during the course of the project research. These case studies are published, along with their theoretical findings in a three volume work, Bächler, et al (1996). This volume contains: M. Abdul Hafiz and Nahid Islam, "Environmental Degradation and Intra/Interstate Conflicts in Bangladesh;" Mohamed Suliman, "Civil War in Sudan: the Impact of Ecological Degradation;" Mohamed Suliman, "War in Darfur or the Desert versus the Oasis Syndrome;" Peter B. Okoh, "En-

vironmental Degradation, Conflicts, and Peaceful Resolution in Nigeria and between Nigeria and Neighboring States;” Stephan Klotzli, “The Water and Soil Crisis in Central Asia: A Source for Future Conflicts?”; Stephen Libiszewski, “Water Disputes in the Jordan Basin Region and Their Role in the Resolution of the Arab-Israeli Conflict;” Gunther Bächler, “Rwanda: The Roots of Tragedy, Battle for Elimination on an Ethno-Political and Ecological Basis.”

¹² See, for example, Eckstein (1975); Campbell (1975); George (1979); George and McKeown (1985); Dessler (1991); Yee (1996); Bennett (1997); and McKeown (1999).

¹³ This point is made in McKeown (1999: 172-174). Non-experimental methods have also been widely used in the natural sciences. See McKeown (1999: 171), and Eckstein (1975: 114-115).

¹⁴ Hume was, in fact, highly skeptical of our ability to show causation. His analysis of causation was meant to ascertain the bare epistemic facts that undergird our intuition of causality.

¹⁵ See Grady (1996: 3). A similar distinction between causal effect and causal mechanism has implications for other areas in the natural sciences as well. For instance, although scientists have known for nearly a century that aspirin relieves pain, it is only within the last few years that they have discovered the causal mechanisms behind this pain relief. See Garavito (1999: 108).

¹⁶ Although qualitative quasi-experimental methods, such as the comparative case study, can also detect causal mechanisms, the single-case method is often a more efficient means of discovering these processes. Moreover, because control is extremely difficult to achieve in the comparative method, it is questionable if causal mechanisms can be more accurately detected than with the single-case method.

¹⁷ Kaplan also argues that descriptions, which are often differentiated from explanation, may themselves be explanatory, ‘because the “how” may provide a “why” and not just a “what”.’ Noted philosopher of science, Rom Harré (1985: 40), makes a similar point when he asserts, “In practice we never rest content with laws for which there is no explanation.” One notable criticism of this approach is made by Kincaid (1994: 117), who argues that causal mechanisms can always be discovered at deeper levels (e.g. at psychological or even neurophysiological levels). King, Keohane, and Verba make a similar point (1994: 86). We believe this criticism ultimately fails, however, because a researcher must always conduct their research at a chosen level of analysis, and the causal mechanisms they seek should correspond to the level of analysis of their research. Moreover, if deeper causal mechanisms are discovered, and if they support the theory, then the theory will only be more robust.

¹⁸ Research is sometimes sparked by a preliminary correlation analysis that offers a promising avenue for further research (e.g. the Democratic Peace). Nevertheless, we maintain that a full-blown statistical analysis of these preliminary findings would benefit greatly from case-study research into causal mechanism. The research process then, should be viewed as an *iterative* one, with quasi-experimental and case-study methods complementing one another.

¹⁹ Although the logic for separating the testing and building of theories in quantitative methodologies is sound, Campbell (1975:178-193) shows that this partition is not necessary in case-study research. Campbell convincingly demonstrates that the problem of *ex post facto* hypothesizing is overcome in the ‘pattern matching’ methodology—from which process-tracing was conceived—because this procedure opens the possibility that an hypothesis initially generated by a particular case could subsequently fail to be supported by the same case. Also, see Collier (1993: 115).

²⁰ Although the above quote from Homer-Dixon’s *International Security* article does not refer explicitly to causal mechanism, the underlying approach taken throughout the article consists of an explicit attempt to discover these processes. It is therefore reasonable to assume that the nomothetic claim made in this article refers to causal mechanisms.

²¹ The common mistake among researchers is to omit a variable that should be controlled in a statistical analysis. This can result in what statisticians refer to as a Type I error, where the null hypothesis is true but researchers decide it is false. However, it can be equally dangerous to include a variable that should not be controlled. This can result in a Type II error, where the null hypothesis is false but researchers decide it is true. Cartwright (1979: 429-32) points out that an “irrelevant” control variable can always be found that annuls or reduces a true relationship. A Type II error can also be committed by failing to include a suppressor variable; that is, a variable that, once controlled for, unmask a true relationship. To avoid both Type I and Type II errors, we suggest that researchers use process-tracing to determine the appropriate control variables.

²² A parable recounted by Diana Baurmind (1983:1297) illustrates why research into causal mechanisms can be invaluable in discovering control variables. “The number of never-married persons in certain British villages is highly inversely correlated with the number of field mice in the surrounding meadows. Marital status of humans was considered an established cause of field mice by the village elders until the mechanism of transmission were finally surmised: Never-married persons bring with them a disproportionate number of cats relative to the rest of the village populace and cats consume field mice. With the generative mechanisms understood, village elders could concentrate their attention on

increasing the population of cats rather than the proportion of never-married persons.” Glymour et al. (1987:19-21) oppose Baumrind’s “generative” account of causality. They argue that in fact “never-married persons” *do* cause variation in field mice, even if the causation is indirect, and nothing in the story prevents the use of covariance analysis on uncontrolled samples to discover that the intervening variable is the density of cats. But this belies the process that social scientists use to discover control variables. Without an investigation of the causal mechanisms, it is doubtful that the density of cats would have been included in a statistical analysis.

²³ Although it is not possible for case-study researchers to consider all possible spurious relationships, neither is it possible to include all possible confounding variables in a statistical model. David Dessler (1999: 101) adopts this approach when he suggests that environment-conflict researchers “Test causal claims not against the *null hypothesis* but against rival substantive accounts of political violence in the cases analyzed.”

²⁴ The State Failure Task Force’s Phase II report makes significant strides in this direction. Unfortunately, data limitations seriously impeded their ability to adequately operationalize some key variables. See Esty, et al (1999).

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Environment and Security in an International Context: Critiquing a Pilot Study from NATO's Committee on the Challenges of Modern Society

by *Richard A. Matthew*

In Pakistan's North-West Frontier Province, the combination of severe environmental stress and diffuse, violent conflict along the Afghanistan border might seem to provide an excellent example of the relationships examined in the NATO Committee on the Challenges of Modern Society's (CCMS) new report on *Environment and Security in an International Context*.¹ At first blush, one might conclude that environmental stress in this region is escalating the conflict. However, on closer examination it seems that the effect of environmental stress is mixed. Sometimes it acts to reinforce or trigger conflict, while other times it motivates people to reduce tensions and cooperate to solve problems. It has proven very difficult to model the varying effects of environmental stress in an accurate way. The co-chairs of this CCMS pilot study have undertaken the arduous task of developing a general model of environmental stress and conflict applicable to the entire world. In my experience, modeling a small region of a country abounding with many factors pulling in different directions is so complex that it is impossible to be satisfied with the results.

Although the problem is an exceedingly complex one, the new CCMS report on environment and security is very lucid and well organized. It asks several explicit questions: What is environmental security? How can we model it? What sort of information would be useful to policymakers? And what sort of responses are available?

Much of the value of the NATO/CCMS and Science Programme work on environmental issues is in the process of bringing people together to focus on certain challenges, view them from new perspectives, and, perhaps, come to a shared understanding. These benefits may add value to the task force experience beyond what is written in the report, but I shall consider only the text of the report, recognizing that it is a small part of a valuable and important initiative.

In many ways, it is a bold report. It is bold not only in its recommendations but also in that it addresses the question of complexity very directly, unlike many other policy documents. This is a source of strength, but it also introduces some theoretical problems, which are the focus of my comments.

The report begins by noting that NATO has a long-standing interest in non-traditional security issues, and that environmental stresses are emerging as one of these issues. As anybody who studies environmental history knows, a number of scholars believe that environmental stress has been the driving force behind many events in human history.² The report is not introducing new issues. What is new is that a set of institutions that traditionally have not looked at these issues are now starting to examine them.

Among the questions that have divided scholars and policymakers recently are whether security institutions

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ought to be studying this set of issues, whether these issues are best addressed by security institutions, and whether these institutions bring a certain value to the process that is not found elsewhere. It is important to mention these concerns since many of the conclusions in this report are similar to those of work undertaken by development organizations and other organizations.

One might be encouraged by the apparent convergence of thinking among institutions that ostensibly have little in common. Indeed, one possible value of rethinking security is that this can provide a framework in which dialogue can take place among different groups and institutions, largely free of preconceptions and prejudices. Of course, one might also raise the concern that military institutions are moving into areas already occupied by the development and other communities, and wonder if this will lead to better outcomes in the long run.

One of the fears of those critical of security institutions examining environmental stress is that they will study it from a perspective or with a mindset that simply reinforces or extends their traditional mandates. Critics worry that particular environmental issues will be identified as important, while others will be neglected because they do not fit well into a traditional security framework. Environmental problems identified as security issues, and hence likely to receive support from governments and publics, could begin to monopolize resources. Critics are concerned that the neglected issues might be those most important to the developing world, and that the ultimate result of military involvement will be to reinforce inequalities in the international system.

A different type of concern is that once the state of the environment has been characterized as a security problem in ways relevant to security institutions, a pathway has been created towards the eventual use of force and coercion.

These familiar concerns do not seem justified by the CCMS report. Instead of narrowing the concept of environmental security to cases that could benefit military interests, this report opens the concept up. The authors do this by taking a very liberal position on the social impacts of environmental stress by defining conflict very broadly. By being so broad, the authors are able to be very inclusive. There are many roles for many different institutions. There are clear suggestions of the importance of inter-agency dialogue and cooperation. There is no sense that now is the time for the military to become involved and start solving problems others have not been able to address effectively.

Being broad, however, does introduce some problems in terms of modeling the phenomenon of

environmental stress and conflict or insecurity. The authors of the report are clearly aware of this. Early on, they write, "It is not environmental stress in isolation that characterizes the nature of conflict between groups, but other factors." (My emphasis)

Insofar as other factors include things like poverty and inequality, the report validates policies aimed at promoting development and social justice. In being so inclusive, however, it also reproduces a problem that is widespread in the field of environmental security. Today one wants to learn not that many factors—including environmental ones—lead to stress, but rather the extent to which environmental stress is related to conflict. Put another way, how much leverage will reducing environmental stress give us over conflict and insecurity? By using a very inclusive model, it becomes difficult to distinguish cases in which environmental stress is actually contributing to conflict in important ways, and ought to be managed, from cases in which it is other factors that are important. Equally worrisome, if we simply assume that environmental stress is always a part of the problem and therefore must be dealt, we may actually be neutralizing what some historical work suggests is an important progressive element in a lot of social conflict situations. We may actually make the situation worse, because it is often environmental stress that causes people to cooperate on problems and resolve some of the social tensions that exist. In other words, one wants to know (a) whether one should devote resources to environmental stress in a given case, and, if so, then (b) when the deployment of these resources is likely to be most effective. A model that does not distinguish among those cases where environmental stress needs to be addressed, those where it is playing a minor role, and those where it may be having a diffuse therapeutic effect, makes it difficult for policymakers to act with confidence.

The authors of this report have provided a very comprehensive conceptual model. The next phase might be to clarify those feedback mechanisms that are reinforcing conflict outcomes and those that are offsetting them, and the conditions under which these dynamics are operative. Then the model can be pared down and researchers and policymakers can try to identify time sensitivities to see which variables should be addressed immediately and how they can apply resources most efficiently to obtain desirable outcomes. Unfortunately, I am not sure that this sort of fine grain predictive modeling can be accomplished given the complexity of conflict. We may have no choice, ultimately, but to use very general conceptual models such as this as a starting point for detailed case specific analysis that can yield clear policy preferences.

A good example of this modeling concern is the second phase of the State Failure Task Force project.³ The task force's report suggests that researchers should only focus on large environmental stresses in a specific area over a short time period because beyond that point, the issues become too complicated to trace out causal relationships. This may not be right, but it is worth noting that the Correlates of War Project researchers invested much time into modeling conflict so that they would be able to predict it, and they were unsuccessful. Understanding and predicting conflict are big challenges, and perhaps the CCMS model goes as far as researchers can with very general, abstract models.

There are a few specific items in this report that I would like to raise questions about. One is the proposed typology of environmental conflict cases, the topic of chapter three. I disagree with the authors' claim that a typology has to meet certain complexity requirements. A typology requires a clear organizing principle. That is what a typology is. For example, one can collect food eaten at a meal and organize it in a number of different ways, such as by fat content, by the cost of it, or by its shelf life. Each of these might be valuable for a certain end. But if I divided the food into green food, food that comes from the ocean, and food that has a lot of protein, one might ask me why I was organizing food stuffs into this particular typology? What is my ordering principle? In this report, readers need to be told what logic informs the division into migration conflicts, ethnic conflicts, and resource scarcity conflicts. These do not seem to cover all cases of conflict—surely some conflict is

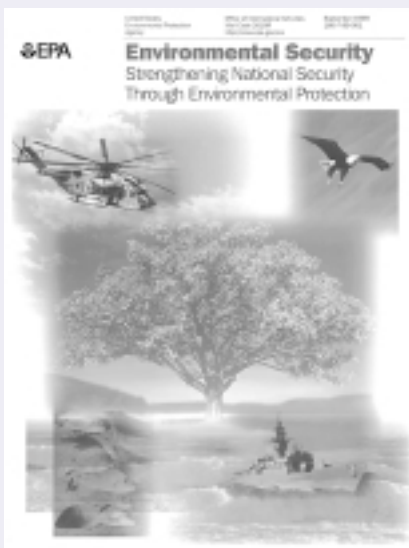
caused by disputes over status, wealth, injustice, or power but lacks any ethnic, environmental, or migration component. Nor does it seem that these three cases always have a significant environmental dimension, although they might in some distant and indirect fashion. Nor, finally, does it seem that only these cases ever have a significant environmental component. The conflict in Kakadu National Park in Australia is between those committed to the spiritual value the land holds for some indigenous peoples and those seeking to exploit the uranium it contains. I do not want to suggest that the report's typology is not valuable, but rather that its value needs further explanation.

This same problem is repeated in chapter four on integrated risk assessment where the authors present sixteen syndromes of environmental stress. This stands in sharp contrast to Thomas Homer-Dixon's work, which simplifies environmental stress into three categories of scarcity (supply-induced, demand-induced, and structural).⁴ One of the benefits of Homer-Dixon's categorization is that it is very easy to understand and use. The CCMS model proposes sixteen syndromes generating four conflict types with five levels of intensity, which results in 320 different cases. The value of this level of differentiation needs to be carefully explained, because one might justifiably feel overwhelmed by its complexity and hence inclined to raise questions about its validity. Certainly the world is complex; but models aimed at the policy world ought to reduce this complexity in a manner that has some explicit value, rather than reflect it. Perhaps the problem is that there is no

New Brochure from the Environmental Protection Agency

"Environmental Security: Strengthening National Security Through Environmental Protection" is a new brochure released by the Environmental Protection Agency, detailing the agency's outlook and activities on environmental security. In addition to defining environmental security and providing examples of specific projects on which EPA has worked, the brochure features synopses of other organizations including ECSP, and how they are working to foster dialogue on the critical connections between environment and security.

For more information please contact the Environmental Protection Agency, Office of International Activities, MC 2660R Ronald Reagan Building, 1300 Pennsylvania Ave, NW, Washington, DC 20460.



analytical filter that distinguishes how often these sixteen syndromes appear or how likely it is that they will connect to the various levels of intensity in the various conflict situations. Including such a filter would provide the reader with a clear sense of the benefits of using this approach rather than Homer-Dixon's simple tripartite structure.

Finally, it is premature to discuss indicators and identify thresholds, as the authors attempt to do. Obviously it would be tremendously valuable to be able to say, here are the key indicators of environmentally-induced conflict, and here are the thresholds that, once surpassed, contribute to or trigger or generate conflict. But the conceptual model does not actually provide a basis for identifying indicators or thresholds. I suspect the authors are fully aware of this, which may explain why, in the end, the report moves away from prediction, its stated objective, and towards prevention and risk management, which are much more compelling policy approaches.

In this context, it is difficult to disagree with the recommendations of the report. The authors provide a logical and compelling set of prescriptions.

In the end this report reaffirmed my personal belief that environmental stress and conflict are often related in significant ways. However, it also reaffirmed my belief that we are a long way from developing a simple model that will adequately explain this relationship or provide us with the means to make useful predictions. This may not please policymakers who want clear evidence of cause and effect, predictive models, and assurance that if they do X, Y will or will not happen. But these are very difficult demands to satisfy.

The authors of the report do a good job in conveying the complexity of this issue. Their general conceptual model is successful in reminding us that many factors can and do lead to conflict. Moreover, in some cases, environmental stress will be one of these, and perhaps even the dominant factor. Therefore the study of conflict ought to include consideration of environmental stresses. Attempts to reduce conflict or resolve conflict ought to carefully consider the potential benefits of addressing environmental problems and promoting sustainable environmental policies.

I am less convinced, however, that the authors make a compelling case that the next step is to refine this work into a predictive model. I suspect this would be a very large and costly step, and I doubt that the probability of success is very high.

The report is concise, engaging and useful, but it might better serve as the foundation for: (a) further discussions about vulnerability, risk management, and conservation measures; (b) case specific analyses of en-

vironmental stress as a strategy for conflict prevention or resolution; (c) inter-agency and transnational dialogue about the environmental security paradigm; and (d) exploration of the roles of conventional security institutions within the context of this paradigm.

NOTES

¹ Gary Vest, Principal Assistant Deputy Under Secretary of Defense for Environmental Security and Kurt Lietzmann, Head of Division, Nature Conservation and Nuclear Safety, Federal Ministry for the Environment, Germany co-chaired and co-authored this NATO/CCMS pilot study on environment and security. This commentary is an extension on comments made at an Environmental Change and Security Project meeting, held on 1 September 1999, featuring the pilot study's release in the United States.

² See for example, Jared A. Diamond, *Guns, Germs, and Steel: The Fates of Human Societies*. New York: W.W. Norton and Co., 1999; Clive Ponting, *A Green History of the World: The Environment and the Collapse of Great Civilizations*. London: Penguin Books, 1993; Brian M. Fagan, *Floods, Famines, and Emperors: El Niño and the Fate of Civilizations*. New York: Basic Books, 1999; and Richard E. Leakey, *The Origin of Humankind*. New York: Basic Books, 1996.

³ In response to a request from Vice President Al Gore in 1994, the Central Intelligence Agency established the "The State Failure Task Force," a group of independent researchers to examine comprehensively the factors and forces that have affected the stability of the post-Cold War world. The Task Force's goals were to identify the factors or combinations of factors that distinguish states that failed from those, which averted crises over the last forty years. The study represents the first empirical effort to identify factors associated with state failure by examining a broad range of demographic, societal, economic, environmental, and political indicators influencing state stability. To read excerpts of the report, please see Daniel C. Esty, Jack A. Goldstone, Ted Robert Gurr, Barbara Harff, Marc Levy, Geoffrey D. Dabelko, Pamela T. Surko, and Alan N. Unger, "State Failure Task Force Report: Phase II Findings." *Environmental Change and Security Project Report 5* (Summer 2000): 49-72.

⁴ See for example, Thomas F. Homer-Dixon, *Environment, Scarcity, and Violence*. Princeton, NJ: Princeton University Press, 1999 or Thomas Homer-Dixon and Jessica Blitt, eds, *Ecoviolence: Links Among Environment, Population, and Security*. Lanham, MD: Rowman and Littlefield, 1998.

Environment, Population, and Conflict: Suggesting a Few Steps Forward

by Richard A. Matthew and Geoffrey D. Dabelko

The thesis that environmental stress and population change contribute to violent conflict has undergone intensive examination over the last ten years.¹ Both case study and quantitative efforts have sought to unpack the complex mix of causal factors leading to violent conflict. Historically neglected in the study of conflict, environmental stress has moved into mainstream debates for a combination of reasons including the findings of new research on the pervasiveness and magnitude of environmental degradation, opportune political timing, and the search for an orienting post-Cold War security paradigm.

On 19 March 2000, a group of scholars assembled at the University of California, Irvine to examine the current state of environment, population, and conflict research and to discuss the most promising directions for future research.² Dividing their discussions into findings, methodology, and next steps, these frequent contributors to the literature engaged in a lively debate over the precise nature of causal dynamics and the most appropriate methods for investigating environmental-social linkages.³

Consensus on key issues was not forthcoming and the seemingly contradictory claims advanced by different researchers dictate the need for additional research and methodological diversity in the field of inquiry. Yet a number of important, unifying themes emerged from the discussions that give this sub-field a clear history, identity, and future. From our perspectives as co-chairs of the workshop, we seek to group points of convergence and highlight areas of continued dispute. We hope this reporting facilitates the entry of new researchers into the field, the clarification of next steps for active scholars, and the utilization of findings by practitioners.

COMMON THEMES, DIVERSE PERSPECTIVES

Methods

- The multiple methodologies applied to the environment as a cause of conflict thesis have identified a number of causal pathways, both general and case specific, with a higher level of confidence in the latter. All findings agree on the importance of intervening political, economic, and social variables, something various investigators have termed capacity, vulnerability, or ingenuity.⁴ These societal variables appear critical in determining whether or not a country or a society can adapt to environmental and demographic stress in a manner that avoids conflict.

Despite some convergence of conclusions, fundamental differences among prominent research efforts remain. The Toronto Group,⁵ commonly associated with a case study approach, places environmental and demographic stress at the center of its causal diagrams. Need, in the form of various scarcities, contributes to the conditions that precipitate violence. Conversely, some elements of the Oslo Group⁶ utilize quantitative methods and find that abundance of natural and mineral resources correlates with violence. Greed then, rather than need, contributes to violence in a different set of cases also experiencing conflict according to this body of research.⁷ These need versus greed causal claims remain to be satisfactorily reconciled.

- Differences along the lines of preferred methodologies persist as they do in other realms of social science. Large N quantitative and theory-driven studies may have reached points of diminishing returns, at least until a new wave of in-depth case studies can be conducted. These methodologies have proven valuable for identifying associations of variables. Yet, in the absence of extensive fieldwork, it is difficult to move to the next step of developing truly persuasive causal arguments.
- Insofar as large N studies are concerned, data quality and quantity currently available are mixed over space and time functions. Furthermore, the incredible complexity of the conflict stories in individual cases provides a constant cautionary reminder of the impediments to designing generalizable analyses and uncovering generalizable conclusions that are not highly abstract and hence of limited interest or value. These methods of statistical inquiry remain vital to the field, however, as checks on case studies, while providing guidance for more detailed research into particular cases or types of cases that may be fruitful.
- For theory-driven work such as that undertaken by Thomas Homer-Dixon,⁸ the acknowledged critical next step is developing far more nuanced understandings of causal mechanisms and intervening variables through more finely detailed case studies. It is vital at this juncture that the next interdisciplinary wave of researchers move into the field to do fine grain analysis that is informed by and sensitive to local conditions. Such work is needed to better understand the interactions among environmental, political, economic, and social variables. One clear need is to generate better understandings of the elements and dynamics of adaptation to environmental stress.
- If environment, population, and conflict research is to be policy relevant and tell as complete and accurate a story as it possible to tell, it is going to have to break free of the Western knowledge base and its institutions. More frequent and meaningful participation of developing country scholars and practitioners is critical to understand better the dynamics of many of the cases in which the linkages among these variables would appear to be most pronounced. Although some efforts have been made in this direction,⁹ the research remains largely conducted by European and North American scholars and practitioners despite the overwhelming focus on South-

ern cases. North-South collaborative work is difficult to establish, time-consuming, and often expensive. Yet it is fundamental to real progress in the evolution of this line of research inquiry.

- Despite the recognition for some years of the need to study the null cases, or cases where environmental and demographic stress are severe but no conflict is present, attempts to address this explicit research need remain scattered and have clearly not yet reached critical mass. The call for more case study work includes a call to investigate why the dogs bark in some cases but not in others in the face of similar levels or forms of environmental stress. Such case studies could also provide a window into the forces generating various forms of cooperation in the face of shared stress. This cooperation, the potential basis for environment confidence or peace-building, represents an under-explored but critical next step in understanding environment, population, and conflict linkages.¹⁰

Data

- Prominent investigations by research groups such as the State Failure Task Force,¹¹ the Oslo Group, the Toronto Group, NATO's Committee on the Challenges of Modern Society,¹² and the Environmental Conflicts Project (ENCOP),¹³ have all come to the conclusion that we do not have enough reliable environmental data. Just how much water is being used in different cases? What is the air quality in major urban areas and how is it changing over time? What is the actual rate of deforestation in a given area, or the real amount of arable land available? This is the common—and entirely valid—complaint of many researchers who rely on environmental data. Working with large gaps and unreliable or incommensurable measurements, it is difficult to move beyond crude analyses and back-of-the-envelope projections. The anecdotal, inaccurate, and fragmentary quality of much of the data used today further underscores the importance of fine grain fieldwork.
- Similar problems exist with the intervening variables most models use. For example, attempts to operationalize and measure critical concepts such as capacity, vulnerability, or ingenuity are often compromised by a lack of appropriate data, especially data across space and time boundaries.

Suggesting a Few Steps Forward

In many ways the research conducted during the 1990s on environment, population, and conflict has been

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compelling and influential. It has penetrated the field of security studies, breaking through concepts and theories that staunchly resisted change for decades. It has propelled environmental studies in a bold—and controversial—new direction. It has guided a flurry of policy innovation and interagency cooperation in the United States and abroad. But at the close of the 1990s, the results of several major research initiatives seemed to do little more than reiterate or clumsily dispute claims made by Homer-Dixon, Norman Myers,¹⁴ and others at the start of the decade. The engine driving the research seems to have stalled. This is equally true outside the academic world. Governmental efforts have been bleached of innovation and controversy by the politics that demands consensus or insists that particularly sensitive issues be set aside. Turkish demands to eliminate references to freshwater in the NATO/CCMS pilot study present a glaring example of this kind of problem.

The degree to which the findings of recent studies recall those of earlier ones, or seem exceptionally unfocused and constrained, has led some observers to conclude that the field of inquiry is itself exhausted. This is far from true or even likely. What is needed today is a new wave of meticulous fieldwork generating case studies that will provide fuel for a new round of theory development. We believe that contemporary communications technologies conspire to create the false and arrogant impression that we generally have a good sense of what is happening on the ground in the far reaches of the globe. This facile, ungrounded expertise, which shifts the emphasis of scholarship to highly abstract debates, is proving the death of any authority the social sciences may once have had—clearly no substitute measures up to fieldwork insofar as understanding and modeling complex causal networks linking social and ecological systems is concerned.

The UCI discussions pointed to a needed direction for research that focuses on cases where environmental stress is present but a spectrum of outcomes from cooperation to conflict occurs. This approach will be critical in helping resolve the Oslo Group-Toronto Group argument of need versus greed as precipitators of conflict. It will also help answer the conflict versus cooperation questions that have been asked repeatedly by critics of the field, yet remain to be answered.¹⁵

In addition to the work required to improve our understanding of complex environment-population-conflict linkages, the sub-field is, inevitably perhaps, plagued by lingering problems over the nature of causality and the most productive and appropriate methodologies.¹⁶ These problems vex other fields of inquiry and the environmental and demographic stress interactions should not be held to a higher standard than is the case in investigations of other causal variables. In other words, some of the criticism is based on unrealistic expectations or demands, which have not been met anywhere in the social sciences.

This is not to say that the causal and methodological debates should be terminated. These methodological debates will help sort out the very different conclusions drawn from various research programs. As workshop participant and methodology expert David Dessler emphasized, it is critical to return to the basic distinctions among association, correlation and causation when evaluating research and drawing scholarly conclusions and policy lessons. Focusing on methodological limitations would likely lead to more cautious causal claims and to narrow differences between opposing research conclusions. Progress must be ongoing and interactive; theory guiding research, leading to a reworking of theory, identifying further research needs, and the repetition of

this evolutionary process. In this case, what is really needed today is more high quality research that might help drain the sea of some of its competing, abstract, and highly similar models and concepts.

The efforts to untangle the linkages among environment, population, and violent conflict have accomplished a great deal in a short period of time. Environmental and demographic stress are firmly on research and practitioner agendas, as these stresses are understood to be part of the complex causal mix that shapes the character and behavior of our social systems. Although their impacts often are felt early and/or indirectly in the causal chain,¹⁷ environmental and population variables have been added—rightly—to the basket of more traditional causes of violent conflict. This attention is given despite the inability to provide precisely weighted linkages (arguably an unreachable standard in the realm of complex social phenomena). Reaching this threshold of inclusion and consideration is a tangible contribution made in the last ten years of research, one that holds promise and relevance to both scholarly and policy communities. Having raised as many questions as it has answered, the field of inquiry must now conduct the more varied and in-depth fieldwork that will allow us to build on the foundation of knowledge that exists today.

NOTES

¹ For an extensive list of works in the field, see the bibliographic guide to the literature published in the Woodrow Wilson Center's annual *Environmental Change and Security Project Report*, available on-line at <http://ecsp.si.edu>.

² This workshop was co-sponsored by the University of California, at Irvine's Focused Research Group on International Environmental Cooperation and the Woodrow Wilson Center's Environmental Change and Security Project. The workshop was made possible by support from the co-sponsors and the International Studies Association workshop program.

³ See the participant list at the end of this article.

⁴ In 1998, Phase II of the U.S. State Failure Task Force results focused on "capacity" and "vulnerability" in an environmental sub-model. Thomas Homer-Dixon of the University of Toronto utilizes the term "ingenuity." In response to a request from Vice President Al Gore in 1994, the Central Intelligence Agency established the "The State Failure Task Force," a group of independent researchers to examine comprehensively the factors and forces that have affected the stability of the post-Cold War world. The Task Force's goals were to identify the factors or combinations of factors that

distinguish states that failed from those, which averted crises over the last forty years. The study represents the first empirical effort to identify factors associated with state failure by examining a broad range of demographic, societal, economic, environmental, and political indicators influencing state stability. To read excerpts of the report, please see Daniel C. Esty, Jack A. Goldstone, Ted Robert Gurr, Barbara Harff, Marc Levy, Geoffrey D. Dabelko, Pamela T. Surko, and Alan N. Unger, "State Failure Task Force Report: Phase II Findings." *Environmental Change and Security Project Report* 5 (Summer 2000): 49-72; Thomas Homer-Dixon, *Environment, Scarcity, and Violence*. Princeton, NJ: Princeton University Press, 1999; Thomas F. Homer-Dixon, "The Ingenuity Gap: Can Poor Countries Adapt to Resource Scarcity?" *Population and Development Review* 21 (September 1995): 587-612; Daniel M. Schwartz, Tom Deligiannis, and Thomas Homer-Dixon, "The Environment and Violent Conflict: A Response to Gleditsch's Critique and Some Suggestions for Future Research." *Environmental Change and Security Project Report* 6 (Summer 2000): 77-94.

⁵ The Toronto Group commonly refers to the work of Thomas F. Homer-Dixon and colleagues affiliated with the University of Toronto. Homer-Dixon has led three major

research projects in the 1990s, producing a large number of qualitative case studies on environment, scarcity and violence. See citations listed in endnote 5. Toronto Group research can be accessed at <http://www.library.utoronto.ca/www/eps/state.htm>.

⁶ The Oslo Group commonly refers to a set of researchers affiliated with the International Peace Research Institute, Oslo (PRIO). PRIO researchers have made both qualitative and quantitative contributions to the environment, population and conflict literature, including a set of prominent critiques. See Nils Petter Gleditsch. "Armed Conflict and the Environment: A Critique of the Literature." *Journal of Peace Research* 35:3 (May 1998): 381-400; Wenche Hauge, and Tanja Ellingsen. "Beyond Environmental Scarcity: Causal Pathways to Conflict." *Journal of Peace Research* 35:3 (May 1998): 299-317; Nils Petter Gleditsch, ed. *Conflict and the Environment*. Dordrecht: Kluwer Publications, 1997; Dan Smith and Willy Østreg, eds. *Research on Environment, Poverty and Conflict: A Proposal*. (PRIO Report 3/97) Oslo: Fridtjof Nansen Institute and International Peace Research Institute, Oslo, 1997; Indra de Soysa and Nils Petter Gleditsch. "To Cultivate Peace: Agriculture in a World of Conflict." *Environmental Change and Security Project Report* 5 (Summer 1999): 15-25; Indra de Soysa and Nils Petter Gleditsch. "The Natural Resource Curse: Are Civil Wars Driven by Need or Greed?" Paper presented at the International Studies Association annual convention. Los Angeles, CA, 14-18 March 2000; Paul F. Diehl and Nils Petter Gleditsch, eds. *Environmental Conflict*. Boulder, CO: Westview Press, forthcoming 2000.

⁷ Indra de Soysa and Nils Petter Gleditsch. "The Natural Resource Curse: Are Civil Wars Driven by Need or Greed?" Paper presented at the International Studies Association annual convention. Los Angeles, CA, 14-18 March 2000.

⁸ See Thomas F. Homer-Dixon, "On the Threshold: Environmental Changes as Causes of Acute Conflict." *International Security* 16:2 (Fall 1991): 76-116; Thomas F. Homer-Dixon. "Environmental Scarcities and Violent Conflict: Evidence from Cases." *International Security* 19:1 (Summer 1994): 5-40; Thomas F. Homer-Dixon. *The Environment, Scarcity, and Violence*. Princeton, NJ: Princeton University Press, 1999. See also Colin H. Kahl. "Population Growth, Environmental Degradation, and State-Sponsored Violence: The Case of Kenya, 1991-93." *International Security* 23:2 (Fall 1998): 80-119.

⁹ For example, developing country participation in research is an explicit principle for research conducted through the Global Environmental Change and Human Security Project <<http://www.gechs.org>>.

¹⁰ See Ken Conca, "Environmental Cooperation and International Peace." *Environmental Conflict*. Paul F. Diehl and Nils Petter Gleditsch, eds. Boulder, CO: Westview Press, forthcoming 2000; Ken Conca and Geoffrey D. Dabelko, eds. *Environmental Peace-Making* (manuscript in preparation).

¹¹ *Esty et al.*, 1998. See endnote 4 for a description of the State Failure Task Force.

¹² Germany and the United States co-chaired a three-year pilot study of environment and security with a special focus on environment, population, and conflict ending in 1999. See Kurt M. Lietzmann and Gary D. Vest. *Environment and Security in an International Context*. NATO/Committee on the Challenges of Modern Society, 1998. See also Issue 5 of the *Environmental Change and Security Project Report* for excerpts of the pilot study report.

¹³ ENCOP was a major Swiss research project co-directed by Günther Baechler of the Swiss Peace Foundation and Kurt Spillmann of the Center for Security Studies and Conflict Research at the Swiss Federal Institute of Technology. ENCOP researchers conducted over forty qualitative case studies on environment, population and conflict. ECOMAN, succeeded ENCOP in the late 1990s to focus on the environment, population and conflict linkages in the Horn of Africa. See Günther Baechler, Volker Böge, Stefan Klötzli, Stephan Libiszewski and Kurt R. Spillmann. *Kriegsursache Umweltzerstörung. Ökologische Konflikte in der Dritten Welt und Wege ihrer friedlichen Bearbeitung*. [Ecological Conflicts in the Third World and Ways for their Resolution.] Vol. I, Zurich: Ruegger Verlag, 1996; Günther Baechler and Kurt R. Spillmann, eds. *Environmental Degradation as a Cause of War*, Vol.s 2-3. Zurich: Ruegger Verlag, 1996; Günther Baechler. "Why Environment Causes Violence: A Synthesis." *Environmental Change and Security Project Report* 4 (Summer 1998): 24-44; Günther Baechler. *Violence through Environmental Discrimination: Cause, Rwanda Arena, and Conflict Model*. Dordrecht: Kluwer Academic Publishers, 1999.

¹⁴ Norman Myers, *Ultimate Security: The Environmental Basis of Political Stability*. New York: W.W. Norton and Co., 1993.

¹⁵ Conca, forthcoming 2000; Conca and Dabelko, forthcoming.

¹⁶ David Dessler, "Review of *Environment, Scarcity, and Violence*." *Environmental Change and Security Project Report* 5 (Summer 1999): 100-101.

¹⁷ While current research suggests this early and/or indirect environmental and demographic causal contribution, it is worth briefly noting that environmental change does not always occur in a linear fashion. The natural environment's propensity to have thresholds, that when crossed, can lead to sudden environment shifts (such as in temperature or precipitation patterns), raises the distinct possibility that environmental stress may play more direct and precipitating roles in violence.

To Cultivate a New Model: Where de Soysa and Gleditsch Fall Short

by Ted Gaulin

There is a tendency in the environmental security literature to criticize the work of Thomas Homer-Dixon.¹ Primary among the critiques, are that his models are too complex,² that key terms are vague,³ and that, when stripped down to their essence, his models do not tell us anything new.⁴ Yet research efforts that seek to improve upon Homer-Dixon's work have not produced models with more explanatory power or models that contain new insights. Indeed, in many instances, such efforts take us backwards rather than forwards in our understanding of the dynamics of human vulnerability and conflict. One example of this is an article by Indra de Soysa and Nils Petter Gleditsch entitled "To Cultivate Peace: Agriculture in a World of Conflict."⁵

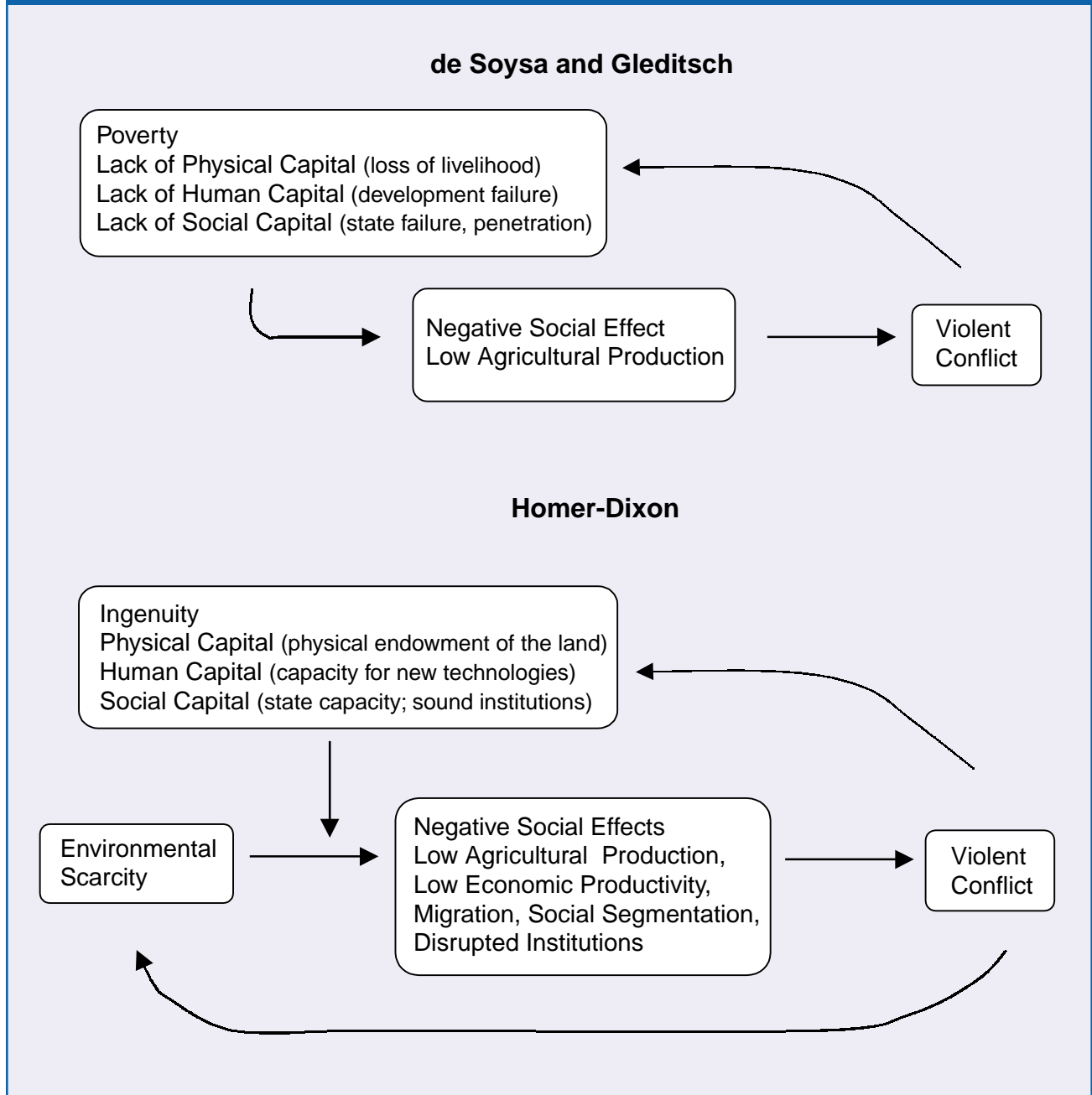
In "To Cultivate Peace," de Soysa and Gleditsch argue that a lack of physical, human, and social capital—what they call poverty—reduces agricultural production, which often leads to violent conflict. Their point is well taken, and their discussion of the interactions that give rise to violence (e.g. rent seeking, urban bias, etc.) is interesting. However, a careful analysis of the basic causal processes that de Soysa and Gleditsch describe, reveals that *they are covering the same terrain previously covered by Homer-Dixon*. To be sure, the terms used by the different authors vary but the meanings and processes are the same. For example, in Figure 1 (following page), where I have sketched out de Soysa and Gleditsch's basic argument, one sees that in both models, the outcome is largely determined by the presence or absence of physical, human, or social capital. De Soysa and Gleditsch call the lack of these attributes "poverty;" Homer-Dixon calls the lack of these attributes an "ingenuity gap." In both models, it is a lack of adaptive capacity, whether one calls it poverty or an ingenuity gap, that leads to deleterious social effects. In de Soysa and Gleditsch's model, the focus is on low agricultural production; in Homer-Dixon's model, low agricultural production is one of five negative social effects. In both models, the negative social outcome is the proximate cause of violent conflict and, in both cases, violence has a positive feedback into the system. For de Soysa and Gleditsch, conflict exacerbates the conditions of poverty; in Homer-Dixon's model, it exacerbates scarcity and reduces ingenuity.

In short, the model proposed by de Soysa and Gleditsch bears an uncanny resemblance to the Homer-Dixon model of which they are critical. Of the two, Homer-Dixon's is more elaborate because it attempts to explain more. For example, Homer-Dixon's model covers cases in which negative social effects besides agricultural decline lead to violent conflict. In this respect, Gleditsch and de Soysa have succeeded in avoiding what they view as one of the problems with Homer-Dixon's work, namely the high level of complexity. However, in doing so, they have produced a model that is largely derivative⁶ and has less explanatory power than its progenitor.

The value of the linkage de Soysa and Gleditsch make between low agricultural production and conflict is limited in so far as low agricultural production is presented as the outcome of a complex and vague set of processes packaged into the concept of poverty. In contrast, Homer-Dixon's model shows that environmental scarcity, rendered destructive due to the lack of social ingenuity, is an important force behind low agricultural production.

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Figure 1. Comparison of the de Soysa / Gleditsch Model and the Homer-Dixon Model



Given the enormous amount of environmental damage that can be traced to agricultural practices, Homer-Dixon's argument makes a good deal of sense and in spite of its complexity, is analytically more focused.

The authors' characterization of agriculturally induced conflict as "apolitical"⁷ is unpersuasive. As Harold Lasswell argued over fifty years ago, politics is, at base, about the authoritative allocation of *resources*. When citizens of a particular country do not have enough to eat because state failure or development failure causes agri-

cultural decline, then the ensuing conflict is essentially *political*. One might also ask why the authors seem to conceptualize subsistence conflicts as a post-cold war phenomenon. Historians have long believed that a subsistence crisis was an important cause of the French Revolution.⁸ Similarly, scholars have argued that chronic food shortages in the 1980s among Latin American peasants made revolutionary movements in those countries particularly compelling, and these revolutionary movements fomented much conflict.

The larger disappointment, however, is that de Soysa and Gleditsch have produced a model that essentially covers the same ground previously covered by Homer-Dixon. Moreover, their model is less compelling than Homer-Dixon's and it adds little to our understanding of the dynamics of human vulnerability and conflict.

When one puts the de Soysa-Gleditsch model in the context of other attempts to improve upon or refute Homer-Dixon's theoretical work (I think of the models proposed in the NATO and CIA studies summarized in this journal), one must conclude that this has not been a very productive approach to improving our understanding of the complex ways in which environmental scarcities interact with social systems. It would, perhaps, be far more fruitful to undertake more extensive field-work in areas facing severe environmental scarcities (as Colin Kahl and others are doing), and then adjust our environment-conflict theories in the light of this detailed empirical evidence.

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NOTES

¹ Critiques include Dabelko, 1999; Dessler, 1999; Deudney, 1999; Dalby, 1999; and Frédéric, 1999. For more on Thomas Homer-Dixon's work, see, for example, Thomas F. Homer-Dixon, "On the Threshold: Environmental Changes as Causes of Acute Conflict," *International Security* 16 (Fall 1991): 76-116; Thomas F. Homer-Dixon, "Environmental Scarcities and Violent Conflict: Evidence from Cases.," *International Security* 19 (Summer 1994): 5-40; and Thomas F. Homer-Dixon, *Environment, Scarcity, and Violence* (Princeton, NJ: Princeton University Press, 1999).

² Gleditsch, 1998.

³ Ibid.

⁴ Levy, 1995.

⁵ de Soysa and Gleditsch, 1999.

⁶ In addition to the basic model, other key elements of de Soysa and Gleditsch echo the work of Homer-Dixon. For example, de Soysa and Gleditsch describe a process called "preemption" in which one party arrogates the limited resources of another group to forestall future shortages. This parallels Homer-Dixon's concept of "resource capture."

⁷ de Soysa and Gleditsch, 1999: 21.

⁸ Schama, 1989.