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Political Economy of the Global Environment

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Abstract. The politicization of global environmental change has already injected scientific evidence (and uncertainties) in the policy domain—national and international. The nature of political discourse has and will continue to be affected by assessments of these changes. The purpose of this concluding discussion is threefold: (a) to identify conceptual elements for analysis of global environmental change which could provide a realistic framework for future research; (b) to identify salient features of the political economy of global environmental change; and (c) to identify key research and policy challenges in the study of international relations. Clearly the institutional and policy-related aspects are recognized by almost everyone as being crucial for developing an overall understanding of global change. Since human activities have contributed to fundamental interventions in natural processes, understanding the social underpinnings of these interventions (institutional, political, economic) is an essential part of an inquiry into the political economy of global change.

The politicization of global environmental change has already injected scientific evidence (and uncertainties) in the policy domain—national and international. The nature of political discourse has and will continue to be affected by assessments of these changes. And it is the political processes that will marshall social responses to global issues and ultimately legitimize the responses to evolving scientific evidence and concerns and corresponding technological options.

In broad analytical parlance, the disciplinary approaches to global environmental changes are composed of roughly three distinct thrusts: the basic sciences, technology and engineering, and the social sciences (institutional, political, economic dimensions of human activities). Each component, grounded in its own disciplinary foundations, brings crucial knowledge to bear upon our understanding of global change. The substantive issues are formidable in scale and scope, as are the theoretical and analytical challenges.

The dependence of policy making in this area on science and on technology and engineering is perhaps more pronounced that in other issues of national or inter-

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national concern. It is necessary now to address the intellectual linkages, cohesion, and development among the three broad disciplinary research agenda. An approach that acknowledges this dependence is essential if the broad intellectual and scientific community is to be a source of insight, even guidance, as the global policy agenda begins to address environmental matters more seriously and its international and political economy dimensions become more pronounced.

These considerations get at the core of the intellectual basis of the social sciences and the foundation for international political economy (IPE). Developed over the better part of two centuries as the disciplines designed to improve knowledge of social interactions, the social sciences have generally been explicitly predicated on understanding *man's* relationship to *man* (the philosophical, political, economic, anthropological, and sociological manifestation of these relationships). The behavioral sciences (a recent addition to the social sciences) seek to identify and quantify regularities in human behavior as the basis for formulating the underlying "laws" of human action. Neither the broader social sciences nor the more narrowly conceived behavioral sciences are currently directed to address *man's* interventions in *nature* nor responses to intended and unintended consequences on nature due to human action. Indeed, the whole concern for understanding the human source of global change lies at the frontier of international political economy as conventionally viewed.

The purpose of this concluding discussion is threefold: (a) to identify conceptual elements for analysis of global environmental change which could provide a realistic framework for future research; (b) to identify salient features of the political economy of global environmental change; and (c) to identify key research and policy challenges in the study of international relations. Clearly the institutional and policy-related aspects are recognized by almost everyone as being crucial for developing an overall understanding of global change. Since human activities have contributed to fundamental interventions in natural processes, understanding the societal underpinnings of these interventions (institutional, political, economic) is an essential part of an inquiry into the political economy of global change.

Challenges of Global Change

The challenges posed by increased appreciation of global environmental change are derived from the following basic imperatives.

First, the engine or driving mechanisms for human sources of global change are clearly traceable back to three interdependent processes: (a) population change and human activities and institutions, (b) technological and industrial development, and (c) patterns of natural resource use. The scientific focus on "natural" dimensions of global environmental change is obviously crucial. The interdependent human processes, however, are central, since demographic changes worldwide generate environmental effects, both directly and through resource use patterns and application of technology, knowledge, and skills. Without adequate focus on the human aspect—socioeconomic, political, and institutional processes—both the sources of change and the possibilities for solutions will be missed.

Second, the reality of policy formulation and implementation, both nationally and internationally, itself necessitates interdisciplinary conceptions, assessments, and approaches. Since human sources of global change are generated through activities and interactions mediated by the institution of society, understanding the role of institutional frameworks is crucial to understanding the social foundations of man-made environmental effects.

Third, the analytical and intellectual efforts on global change—the sciences, engineering, and the social sciences—have followed an independent course in addressing the environmental challenge. While disciplinary efforts are essential and must be pursued, they themselves do not suffice for formulation or implementation of necessary social, institutional, and regulatory interventions required for arresting—possibly reverting—environmental deterioration on a global scale.

Despite the ubiquity of sources of environmental change and its roots in a host of private and industrial actions, it is obvious that the state remains a crucial institution in this regard: the state and the state system remain the only legal jurisdiction enfranchised to act on behalf of citizens or to regulate their behavior. Regardless of the policy responses envisaged—and the role of industry, multinational corporations, and others—the institution of the state cannot be bypassed as a significant factor.

Since the world we live in continues to be defined in terms of national jurisdictions, in formulating the interdisciplinary framework for research, we cannot ignore the policy response *within* states and strategies *across* states which will bring the research problem closer to the realities of the policy context. Clearly, there are already distinct possibilities of conflict among nations traced to global environmental changes, as well as new prospects of cooperation in the quest for viable approaches to the management of global change.

Analysis of the policy responses and the institutional contexts for social adjustments are fundamentally contingent upon the sciences and engineering. Key *inputs* into policy formation regarding the natural record of global change must come from the sciences: key *policy processes* can only be understood in the context of analysis in the social sciences. The range of policy responses, or *outputs*, envisaged are influenced by prevailing application of knowledge and skills, engineering, and technology.

To illustrate: to the extent that the relative contributions of human sources of global change are adequately specified, then the scope of policy interventions can be delineated. Separating human from natural pressures is a science-based input into policy analysis. The delineation is easier for some greenhouse gases than for others. The social sciences' dependence on the sciences for evidence of the traces of human action is matched in part by the social sciences' analysis of demographic and socio-economic changes as inputs into projections of both future changes and magnitudes of human contributions to environmental perturbations.

So, too, the engineering and technological possibilities help frame policy deliberations (as has been evidenced in the energy "crisis" of the 1970s). To the extent that technological alternatives are *now* available at commercially viable prices, the policy deliberations will be facilitated. To the extent that interventions are contingent on *future* investments into technological alternatives, the policy debates will, conversely, be more difficult. Separating the technologically driven components of policy deliberation from the contingent economy-driven components (that is, investments or allocations) reflects the type of engineering/social science interface that calls for systematic inquiry. The challenge at present is to integrate these complex dimensions and competing conceptions of global change, clarifying the linkages among them and articulating the nature of the policy agenda, both national and international. In essence, the task is to create intellectual foundations which would provide bridges between conventional and newer issues of IPE as well as across the three disciplinary orientations.

Elsewhere we have identified the five dimensions of global change that address fundamental connections between global environmental change and international

political economy and that reflect some of the inherent complexities of global processes. These are: (1) problems of uncertainty—much remains unknown; (2) discrepancies in time frames—effects occur on different horizons and scales; (3) dysfunctionality of legitimate behavior—normal and incremental actions or shaping environmental effects; (4) disjunction of transmission mechanism—market, biogeochemical, social, and other mechanisms that "move." As a consequence of (1) through (4) uncertainties in policy are extensive; therefore (5) complexity of policy criteria is inevitable—we do not know what criteria to use in order to choose among policy options (Choucri 1991). All five are elements of the "real world" and of our understanding of the "real world" that impede communication across disciplinary orientations (sciences, engineering, social sciences).

Ambiguities about the appropriate criteria to drive policy responses to global change itself complicate definitions of "the problem." These complications are illustrated by the relative simplicity of the problem of chlorofluorocarbons due particularly to man-made processes compared to carbon dioxide emission, which is ubiquitous, tied to all human actions, and the wide range of criteria already being debated. Conflicts among economic, political, and engineering criteria are often the rule rather than the exception, as are conflicts and trade-offs among social criteria.

These factors jointly frame the crucial conceptual difficulties whose resolution constitutes an important requisite for framing the political economy of global change.

Implications for International Political Economy

Understanding the sources and consequences of human activity will, by necessity, require some respecifying of the analytical and theoretical foundations of international political economy. Within this context markers, broadly construed as mechanisms of exchange, are critical not only for performance of economic activities but also to the ability of the state to apply leverage domestically and externally and to implement its policies effectively. By extension the intense interdependence of economic, political, and strategic security of (and within) the state presents special problems for the effective management of human action on the environment and the interactions between natural and social environments.

Growth and Environmental Degradation

As a consequence of uneven growth and development within and between them, individual states and their impacts upon natural and social environments can be compared in terms of their respective *development patterns*—the relative levels and rates of change of the *population*, access to *resources* (endowment and exchange), and *technology* (knowledge and skills) (Choucri and North, 1989; North, 1990). The *interactions* among these dimensions shape a state's interaction with the natural environment and "nature's" reactions to these interactions—as well as with other states. Each pattern generates its own particular impacts on the natural environments (domestic and external), thus producing its own pattern of effluents and other environmental effects.

In general, therefore, different *development patterns* tend to generate different forms of *effluents* (and environmental effects) and these differences can help frame the global bargaining problem over adjustments of human behavior.

As the only franchised actor in the international and global systems the *state*

contributes to, encompasses, and in a sense presides over all the resource depleting, degrading and polluting that occurs within it and therefore requires a special focus regarding environmental consequences of individual actions. This means that individual human beings—the only true actors within the state—have bargained with one another, negotiated with, and leveraged through institutionalized forms of interaction (culminating in a government, or regime which on the state level refers to the basic assumptions, norms, principles, and activating roles that make governance operational) in order to formulate demands, reach collective decisions, and implement actions in the name of the state.

States and Markets

State functions (and areas of performance) include resource extraction (taxation or some equivalent—indispensable for the maintenance of power), resource allocation (a major source of power-as-influence), the maintenance of some measure of security (economic, political, and strategic), value formulation, and the regulation of domestic activities. Competition among individuals, firms, and other organizations contributes to the distribution of resources, goods, and services, *but also to the generation of wastes and various forms of effluents* throughout the society.

It is now evident that market and economic incentives, which facilitate the production and the distribution of energy and other resources within and across states, often allow the effluents and other residuals to flow back into common property areas of both domestic and external environments (Darmstadter, 1986: 164). Domestically, of course, states have the possibility of legislating sanctions to enforce socially desirable norms, such as public safety and national defense, which do not respond directly to market forces, but internationally and globally, as we discuss later such regulation tends to be much more complex.

More challenging to matters of political economy is the fact that with continuing globalization (population increases, technological growth, and consequent demands for resources, the rhetoric (if not the basic requirements) of economic, political, and strategic security and growth threaten to collide headlong with demands for the preservation and the security of the natural environment.

Patterns of Effluence

Figure 1 shows 129 states with a population of one million or over distributed along population/CO_2 emissions, and Figure 2 shows GNP/CO_2 linkages on a per capita basis. They are illustrative of the differences among patterns of select states in the patterns of relationships as well as interactions between social and natural processes. Each of these patterns tends to generate distinctive interactions with its natural environment, producing characteristic and consequent effluents. As the characteristic features of states *change*, relationships among states also change, affecting the characteristics of the international system and, under certain conditions, the global environment as a whole.

Underlying these differences are variations in life expectancy, a key indicator of quality of life and overall well-being. The industrial states all boast life expectancy of 70 years and over—the United States (76 years), the United Kingdom (75 years), France (78 years), Sweden and Norway (77 years each). Chad (45 years) and Bangladesh (51 years) illustrate the predicament of poorer countries. The other side of the coin is infant mortality: the rankings show the distribution among the less

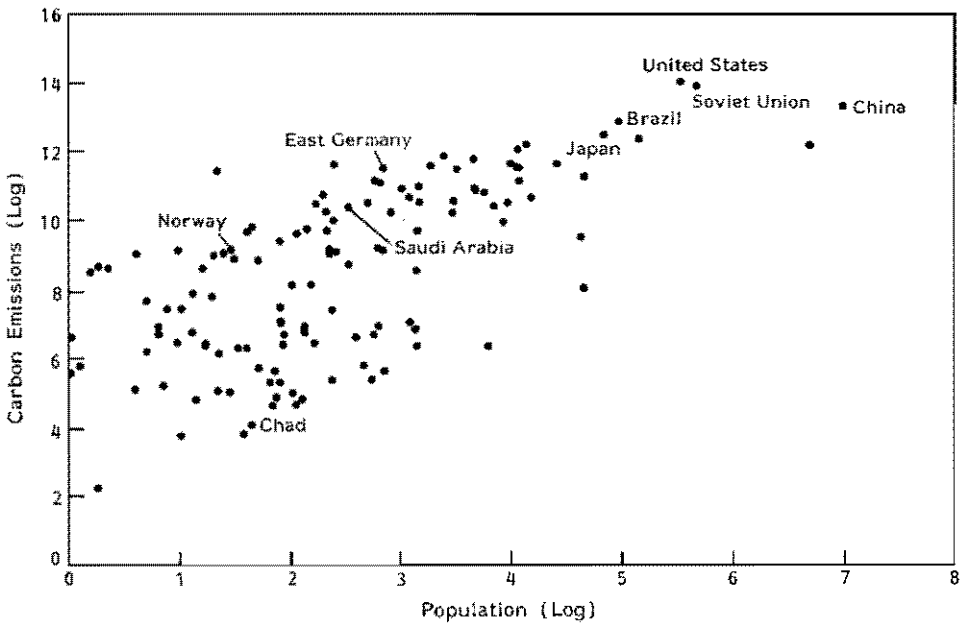


FIGURE 1

developed states. Chad (138/1000 pop.) and Bangladesh (123) contrast sharply with the United States (11), Sweden (6), or Norway (8). Saudi Arabia still has a relatively high rate of infant mortality (61).

As indicated, the powerful states are the most significant producers and consumers of energy worldwide, especially petroleum, reflecting carbon emissions per capita noted above. The United States claims about 23 percent of oil use globally, and the former USSR (Russia and the republics), 15 percent. The same dominance is evident in natural gas consumption: the United States claims 27 percent of global totals, and the USSR 35 percent. Other states, including the industrial, are all in the low single digits (under 4 percent). With respect to coal, roughly similar patterns emerge: the United States accounts for 19 percent of world totals, and the USSR 17 percent. In these terms China's use of coal is an anomaly: China ranks first in the use of coal because of its extensive coal reserves. The combination of geological and demographic factors rank China as the world's third largest source of carbon emission.

Of all the activities generating carbon emissions, the construction industry and production and use of cement are particularly illustrative. Its strong backward and forward linkages in economic activity all but ensure cement use in any building, infrastructure, or physical maintenance activity. China alone accounts for 16 percent worldwide use of cement; the USSR (13 percent) ranks second; and the United States and Japan rank next, each with 7 percent of the global total. Other industrial states are in the single digits.

It would be fair to say that given current practices, the use of fertilizers for agriculture is as crucial as cement is for industry. In these terms fertilizer use—a

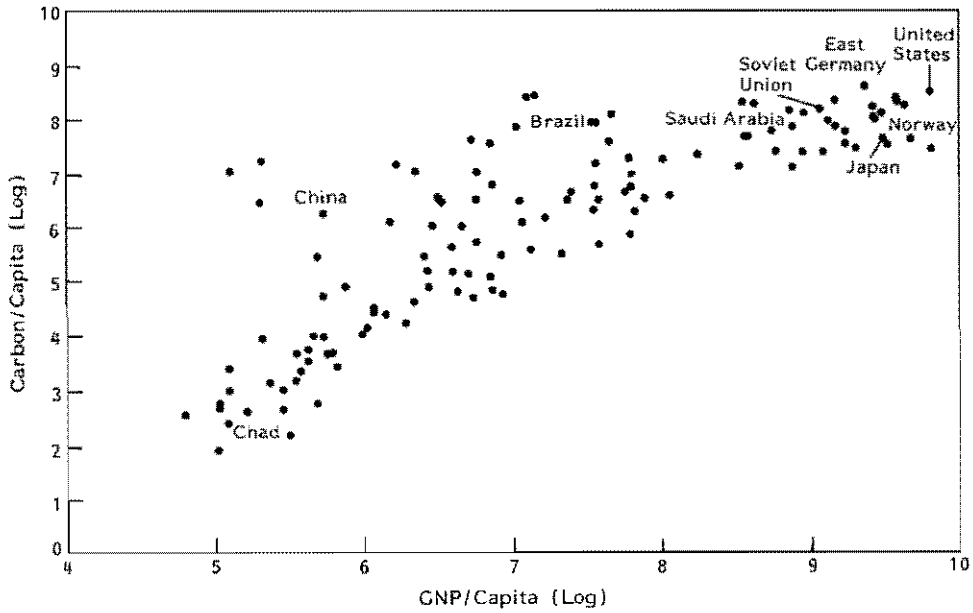


FIGURE 2

significant source of nitrous oxide—also cuts across the patterns, as it is to date a crucial input into agriculture. China claims 20 percent of the global use of fertilizer; the USSR (16 percent) and the United States (14 percent) are all major users. Other major users are no greater than 2 percent each.

Methane generation via rice paddies is a distinctive feature of the larger agricultural states. China alone accounts for 23 percent of the global total of rice paddies (India ranks first worldwide with 29 percent). Bangladesh accounts for 7 percent, as does Indonesia (also a significant oil producer). Agricultural/livestock methane generation is closely tied to activities in developing countries; but there are notable exceptions: the USSR ranks second globally in holdings of domesticated animals (the ruminants' source of methane).

Then, too, deforestation is a significant element of the overall CO_2 budget globally. Deforestation is largely a developing country activity; however, the major actor, Brazil—an industrializing state but also the tenth largest economy in the world—accounts for 20 percent of global deforestation. Indonesia, a significant oil producer, accounts for 12 percent. All others are developing states.

As currently manifested in developed and developing countries, each according to its own pattern of growth and interests, economic growth and "stability" constitute a *sine qua non* for economic, political, and strategic (military) security—jobs, stable markets, investments, health, education, domestic tranquility, national defense, and the like. Developing countries work to achieve these objectives, developed countries to further them. At the same time the increasingly evident implications of economic growth and technological advancement tend to collide with the longer-term environmental security of the human and other species more and more.

Some Global Effects: Monitoring Greenhouse Gases

Four major greenhouse gases generated by different types of human activities—carbon dioxide (CO_2), chlorofluorocarbons (CFCs), nitrous oxide (N_2O), and methane (CH_4)—are illustrative in showing the global aggregation of individual behavior—the variability and the wide range of "normal" and legitimate activities that may be responsible for environmental perturbations. Recognizing that the data on these trace gases vary extensively in quality and quantity and with allowances for interaction, feedback, and differences in residence time in the atmosphere, the often cited scientific consensus converges around the distribution of relative contributions of greenhouse gases to temperature change, residence time in the atmosphere, and annual growth rates for the 1980s, as shown in Table 1.

These trace gases are generated by normal and legitimate human activities; they have variable residence time in the atmosphere; the interactions are uncertain, and the effects are largely irreversible. Because no single state, and no single activity, dominates the environmental degradation patterns, cooperation for managing the commons is essential on a global scale. And since all states contribute to global environmental change, the case for cooperation—strictly on an empirical basis—is compelling.

"Environmental invasion" can be viewed as a mode of interaction analogous to strategic interactions among states of unequal capability. When the expanding activities and interests of two high-capability states intersect or collide, on the other hand, there is always a possibility that either or both will be "environmentally invaded" or otherwise damaged by toxic emissions produced by one or the other. (Sulphur emissions across borders in Europe are illustrative.)

Relative Shares Problem

If climate alteration is seen as a rough dependent variable and carbon dioxide (CO_2) emissions and other trace gases as clear contributors, then the problem of estimating state shares of global totals becomes one of tracing effects through *who* does *what*, *how*, and *how much*. Because of uncertainties in measurement at the source and in the atmosphere, such an exercise can be approximate at best. It may identify

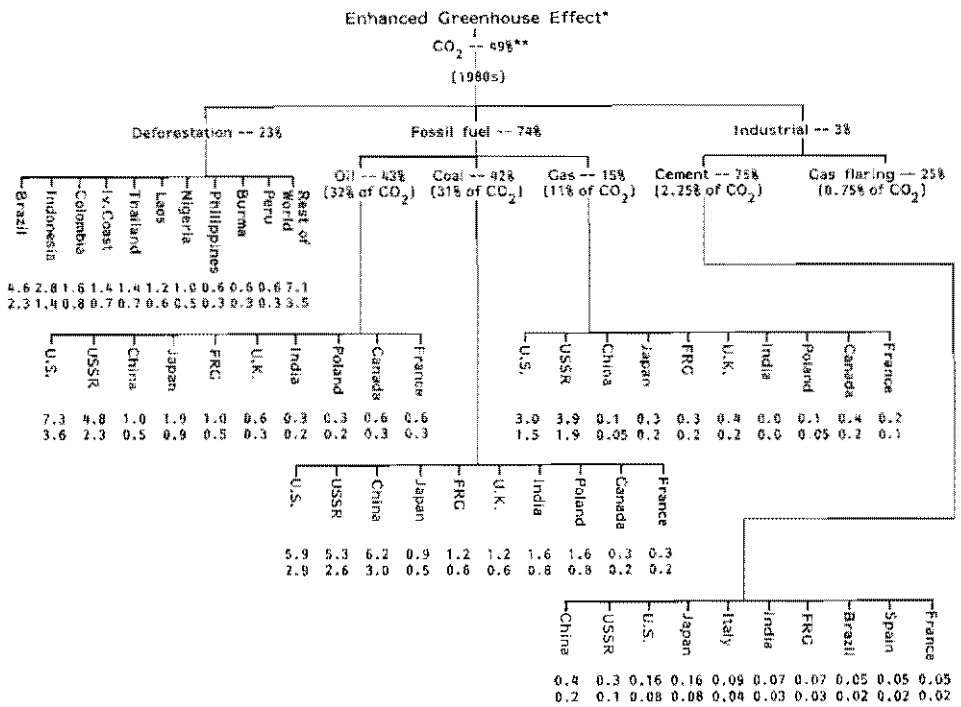
Table 1. *Relative Contribution of Greenhouse Gases.*

Trace Gas	Relative Contribution (%)*	Residence Time (Years)	Annual Growth Rates
CO_2	49	100	0.5%
Methane	18	10	1.0%
CFC 11 and 12	14	60–100	7.0%
N_2O	6	170	.25%
Other	13	variable	variable

*Calculated from Hansen et al. (1988). The uncertainties in these figures must be underscored, as the estimates are subject to revision and are presented here for illustrative purposes only. All quantitative values relevant to climate alteration are subject to extensive uncertainty; the numbers for annual growth rates and residence time are especially open to question.

patterns of responsibility for global warming (given relative shares along individual trace gases, differences in residence time, and interactions with natural forces) and shows a broad range of contributory effects. Figure 3 shows some rough approximation of the relative effects, by state, on overall global balances. Certainly the estimates are rough at best—given the extensive uncertainties—but the differentials remain compelling.

If there is a robust message, it is this: clearly *no* single state alone controls the effects nor is singly responsible for the source activities. There are major differences, of course, and the differences on relative shares become more pronounced on a per capita basis (in detail here). And the empirical basis necessitating coordinated action in the management of global outcomes (disturbances in the commons) becomes more robust. In these terms the figures begin to help show, in simple form, the impacts of industrial states to effluents from industrial processes. However approximate such an exercise may be, it does point to a new reality: it shows who will have to bargain with whom over what.



Notes

The first row in each series indicates % contribution of each state, by activity, to global CO_2 emissions. The second row in each series indicates % contribution of each state, by activity, to enhanced greenhouse effect.

Countries listed under each subheading are the top 10 for total contributions to Deforestation, Fossil Fuel use, and Industrial activities, respectively.

*In percent and rounded.

**Note the inherent statistical inconsistency; 49% of *current* greenhouse effect is the product of all *past* as well as *current* emission.

FIGURE 3

These distributions should be viewed largely as first order effects.[1] The global impacts, in terms of political impacts on global climate alterations, involve some "multiplying through," starting with the relative shares—by activity and by greenhouse gas—to obtain a sense of a state's *total* effect on climate change. This exercise as a first approximation of relative shares serves its purpose. Four inferences, presented here as working hypotheses, may be drawn from these distributions.

First, and most obvious, no single state is responsible for changes in the global environment. Second, industrial countries alone do not account for all of these changes; developing countries, in their own way, also contribute to changes in global environmental parameters. And third, this rough discounting of relative shares is predicated on an intractable methodological problem: the measurements we now have are traces of all *past* as well as *present* emissions. They reflect a cross-sectional view of past and present performance. As a consequence, it is not easy to resolve the problem. The other side of the methodological problem is possibly more tractable, namely, projection of *future* shares, contingent on alternative assumptions regarding growth, development, and environmental policies.

Based on these three inferences, a fourth can now be articulated, namely, that despite methodological problems, the issue of relative contribution to climate alteration still remains central to the empirical realities (and uncertainties) at hand. The United States is the major user of energy; energy is the largest source of CO_2 emissions; and CO_2 accounts for the largest share of the greenhouse gases. By most counts, the United States is a major player. But this dominance is *not* sufficient to account for the global patterns in their entirety or even in a determinant way.[2] Over time the development process itself enhances contributions to the build-up of greenhouse gases, thereby all but assuring the future participation of all states in this process. Because of the long lead time, the complex feedback dynamics, and the irreversibility of many environmental changes, policy interventions set in place now have impacts only in the longer range. The residence time of the individual greenhouse gases all but assures that *past* human effects cannot be eliminated, however effective either *present* policies or *future* commitments might be.

However compelling a view of trace gases generation might be, it is important to stress that *these are not the only global environmental problems*. There are a wide range of environmental transformations—other than those affecting climate—that are now believed to be global in extent (see, for example, Clark and Munn, eds., 1986.)

Challenges for Theory and Policy

As with all future-oriented courses of action, those pertaining to relations between social and natural environments are directly shaped by uncertainties relevant to the calculation of risks and disequilibrating tendencies (economic growth and security *vs.* environmental preservation and security, for example). It goes without saying that uncertainty is endemic in all social environments and undertakings. In the area of political economy, environmental matters have as yet not been given much attention. The research issues raised here are preliminary at best—driven by the concerns noted in this discussion; there is surely much more to be done.

Research Challenges

At a minimum the initial building blocks for the international political economy of global change require attention to four specific problems.

First is the use of scientific evidence for bounding uncertainty. While we recognize that an interdisciplinary program must be anchored in the sciences' core—since definition of these problems is derived from, or predicated on, scientific evidence—understanding the implication of anthropogenic sources requires the transformation of scientific discourse of uncertainty into policy terms, a task that requires direct interaction between scientists and social scientists. To acknowledge uncertainty is near-trivial; to use the characteristic feature of uncertainty (along various dimensions and time horizons) is the research challenge. *How* uncertainties are translated into factors in a policy deliberation is a researchable problem. The national and international policy debates around responses to anthropogenic sources of change is already calling for the bounding of confidence intervals around expectations of future outcomes, as these are transmitted through natural mechanisms. Recognizing that public decisions will be made long before the achievement of scientific consensus does not eliminate, or even reduce, the necessity of incorporating expectations about *future* evidence into *current* policy debates.

The second concerns the analysis of concentration and residence time. Scientific evidence (insight and estimates) on concentration and residence time in the atmosphere for trace gases frames the range of horizons over which socially defined problems emerge and retain salience. Scientific evidence on both concentrations and residence time (and uncertainties regarding feedback) contributes to framing definitions of attendant "problems" and the time horizon for "solutions." The balance between perturbations and amelioration is relevant on both sides of the social equation, problem definition and solution strategy.

The third problem involves an inquiry into coalition and consensus formation. Policy responses—of any type and along any dimensions nationally and internationally—are contingent on the formation of compelling coalitions. The coalition formation problem is defined in two terms, the empirical and the analytical, and the challenge is to bring the insights of one to bear on the other. Defining who the relevant players are in each policy domain is a necessary requisite for bringing alternative analytical techniques on bargaining and coalition formation to bear on strategies for behavioral modification. As indicated below, understanding the institutional mechanisms or contexts in each policy realm is a large part of the challenge.

The fourth entails understanding the framing of adjustment problems. Policy responses at all levels will immediately confront the issue of adjustment: *who* bears the burden of adjustment, *what* will be the tradeoffs, *what* are the direct and indirect economic costs, and *when* will they be borne. Identifying the range of costs and delineating alternative strategies for meeting costs is a necessary input into policy analysis. Without a sense of scale of scope for the costs of adjustments, the policy debates—let alone responses—will remain vacuous at best.

These four tasks address some elemental blocks for building intellectual foundations of a political economy of global change, cutting across levels of analysis as well as disciplinary bounds (that is, the sciences, engineering and technology, and the social sciences). Moving from identification of conceptual issues and existing identification of essential building blocks to a more detailed specification of an interdisciplinary program on global change requires a major intellectual commitment. This problem can be addressed only by scholars who bring their disciplinary training to bear upon the task of articulating interdisciplinary linkages, making "demands" upon their colleagues for insights and information, and seeking in turn to "supply" the processes of interdisciplinary conceptual development.

In the last analysis, understanding the parameters of permissible behavior and

defining socially sanctioned policy responses will come from within the social sciences. The policy formation process, identification of options and consensus formation, will be driven by the way in which the policy debates are framed.

International Policy Challenges

From a policy perspective, it is clear that the double-edged quality—or mixed blessings—of technological development, interacting with population trends worldwide and patterns of resource use, has created problems of a global nature and globalized problems that had earlier been more local or regional in character. These trends point to an incontrovertible direction: not only do we live on this one earth but increasingly in an interdependent world. Possibilities of global change induced by human action are new factors in the policy domain. There are major uncertainties about sources, processes, consequences, and viable modes of response. The greenhouse effect may well be one among several transformations on a global scale to which we must adjust and devise modes of responses—scientific, technological, economic, and political.

The contemporary context is one in which decision- and policy-making at the highest level are vulnerable to the added uncertainties and potential disequilibria of growth, power, competition, and conflict (Cf. Ravetz, 1986: 416; and Timmerman, 1986: 435–440). To the extent that international institutions are developed to manage these concurrent pressures, further degradations can be reduced, even averted. More challenging, and more difficult to manage, is the modification of the *normal* behavior of individuals and collectivities that in the normal course of events generate *dysfunctional* environmental effects, some of which may be essentially *irreversible.*

The 1992 United Nations Conference on Environment and Development (UNCED) was put forth as a major opportunity for bargaining and negotiation and sovereign and non-sovereign actors for modification of dysfunctional behavior. These challenges address the crucial disequilibria engendered by growth, while recognizing the difficulties of complex management under conditions of immense uncertainty. Such ubiquitous uncertainties are compounded, in turn, to the extent that there remains considerable disagreement over relevant "facts" and "realities" of natural processes—including rates and directions of change and probable negative environmental outcomes—and the ways in which specific social activities exacerbate them.

In the absence of any superordinate institution or other international authority, historically, decisions, policies, actions, and outcomes have been effected primarily through diplomatic negotiations and/or armed conflict. With the rapid globalization of transportation, trade, finance, and other international activities, increasing numbers of international régimes have been established, each centered on relevant assumptions, principles, norms, rules, and roles for the regulation of these and other specialized functions (Krasner, 1983). In the environmental area it is clear that short of institutionalized cooperation among nations, the oceans, polar regions, upper atmosphere, and other global commons may remain beyond the reach of effective regulation. The combination of specialized international régimes and appropriate United Nations' agencies should provide a basis for addressing the requirements of resilience and infuse major institutions (on all levels) with a resilience directed toward enhancing responsiveness to environmental changes.

In recent years there has been a discernible trend toward the management and regulation of environmental degradation (Choucri, Haas, and North, forthcoming). Most notable is the convention for prevention of the export of hazardous materials (March 1989) that represents a significant new environmental protocol. So, too, the Montreal Protocol, 1987, for regulation of chlorofluorocarbons (CFCs), which was concluded as an international agreement for the management of global effluents, has important innovative provisions (Benedick, 1989). This effort represents a new phase along the path of international institutional development (Thatcher, 1989; Haas, 1990).[3] At the Conference on Environment and Development, in 1992, the international community embarked on new institutional steps in the direction of global environmental management.

As further discussions evolve worldwide, cross-issue bargaining is likely to expand as a means of global policy formation, in both strategic and tactical terms. Consequently, the development of institutions of management, the purview of concerns and definition of issues is likely to become increasingly global rather than more narrowly international. In the course of inter-state bargaining, moreover, it is likely that the pursuit of global agreements (as on control of CFCs for example) will extend across modes of environmental degradation (as well as jurisdictional boundaries) and, under pressures for behavior modification, lead to a certain amount of "trading in concessions" among states in the system, tying ecological to other issues, and broadening the base of participating non-state actors (such as multinational corporations, non-governmental organizations, private interest groups, and scientific communities among others).

None of the foregoing suggests that the more conventional perspectives of political economy are obsolete or that the traditional issues are no longer relevant. The message is both more compelling and considerably more comprehensive: it is that superimposed over and above the "old" issues are "new" ones that challenge both the research and the policy agenda, nationally and internationally. These "new" challenges pose added complexities as the scientific and intellectual community seeks to comprehend, predict, and manage the world that we have created and the natural environments that have been altered, even transformed, by human activities.

Notes

1. See World Resources Institute (1990) for a ranking of the top 50 states with the highest greenhouse gas net emissions.
2. While the United States is currently the largest contributor of greenhouse gas buildup and its share of global emissions is one-fifth of the total and the current per capita emission in developing countries is low, projecting these trends indiscriminately into the future would be highly misleading.
3. In June 1990, 93 nations adhered to the agreement to ban chemicals harmful to the ozone layer. This agreement goes far beyond the original. Despite a marked reduction of differences of views among industrial and developing states regarding recognition and approach to resolution of this global problem, significant problems remain.

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